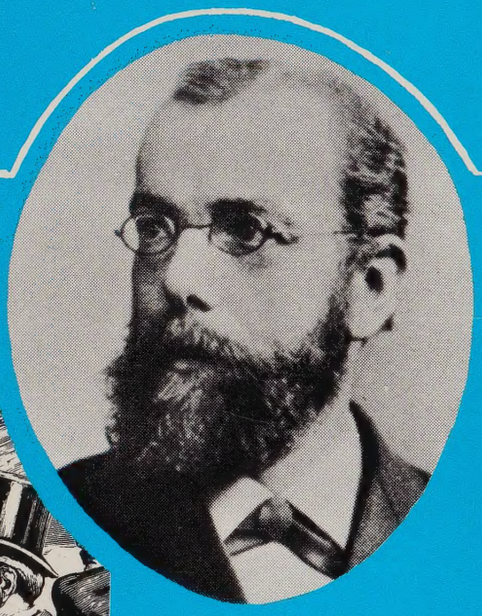
Public Health
Laboratory Service

PHLS
Annual Report
1983/4



PHLS

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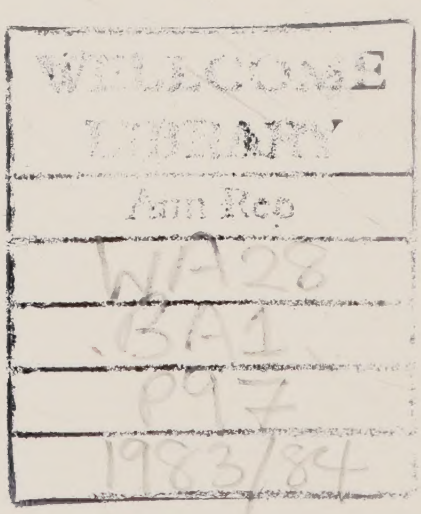
Front cover illustrations: *Public health microbiology 100 years ago*

The summer of 1883 saw a major outbreak of cholera in Egypt, rapidly followed by a further outbreak in India. These two outbreaks were investigated by the German microbiologist, Robert Koch, with a small team of associates. As a result of their investigations, Koch was able to isolate and identify the cholera vibrio, marking a major step in the control of what had previously been a disease responsible for frequent and major epidemics world-wide. The two illustrations show Koch himself, shortly before his departure for Egypt, and shipboard quarantine regulations imposed at Brindisi in Italy during the course of the Egyptian outbreak. [Illustrations supplied by the Robert Koch Institut, Berlin, and the Illustrated London News Picture Library, London, respectively, and reproduced by permission.]



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Contents

Introduction

It has not been found necessary to add further to the changes introduced in the preceding two years to the format of the Report. As before its opening section recapitulates, for reference purposes, the organizational structure and functions of the PHLS.

There follows a statement by the Chairman of the Board in which Dr Gordon Smith draws attention to the upset caused to the Board's strategic planning occasioned by the succession of cuts made in the Board's funding by the Government and to the continuing uncertainty over the outcome of negotiations concerning the commercial future of the PHLS Centre for Applied Microbiology and Research (CAMR) resulting from the need for the parties concerned – Ministers, the commercial companies, and the Board – to examine in depth the full implications of the options under consideration.

In his report on the routine work of the PHLS, the Director of the Service points to a continuation of the upsurge in the work asked of, and accomplished by, laboratories during the year under review, when vacant posts were being "frozen" and the number of staff employed by the Board was smaller. Besides this evidence of increased productivity on the part of those engaged in the routine work of the Service, the PHLS has also been able to maintain a broad range of research activities as that section of the Report illustrates. How far it will be possible to sustain comparable levels of activity in both the routine and research work in the next few years is uncertain and dependent upon both the extent of the reduction in resources and the ingenuity of the staff in circumventing them. These sections are followed by a brief note on the closure of the Venereal Diseases Reference Laboratory.

The section on the administrative and financial aspects of the Service assumes a greater importance in the present era of retrenchment. It does, however, record the completion and opening of two new laboratories – welcome legacies of planning decisions taken in what must now be regarded as the affluent 1970s. Visibly nearing completion is the new Central Public Health Laboratory (CPHL) at Colindale – in this case a longer term investment originating in the 1960s and now coming to fruition.

The work of the Service has many ramifications overseas, in collaborative research, reference services, consultation and advisory work for

international organizations – all these have established the international standing of the PHLS (almost invariably referred to abroad as "Colindale"). The present Report described three examples of overseas assignments during the period it covers.

As last year, the Report concludes with six short articles by individual contributors. These "special topics" have been chosen for their intrinsic interest and demonstration of the width of professional experience to be found in the Service.

The first, on biosensors, comes from one of the laboratories at CAMR in the forefront of the Centre's biotechnology development and offers a fascinating insight into areas of technological advance holding significant implications for the future practice of laboratory medicine.

The second surveys the re-emergence of the antibiotic-resistant staphylococcus – a microbe with which the older generation of microbiologists had to contend. It was never certain how far its subsequent retreat was because of, or despite, the measures they devised.

The third describes the successful linking of a small virus, discovered at Colindale during the 1970s, with a mild, febrile illness of children long suspected as being a virus disease but for which no laboratory confirmation had been possible. Infection by the virus occasionally takes other forms, as the article describes.

The fourth, on automation, is an authoritative and candid assessment of the present "state of the art" in automated equipment and its much debated value to the clinical microbiology laboratory.

The fifth shows how the routine application of laboratory tests to clinically undifferentiated illness can delineate a new occupationally-related hazard – in this case a disease of cattle transmissible to farm workers.

The sixth is a short essay on the deficiences in communication which may arise between laboratory workers and the public and the implications these may hold for each.

The Annual Report results from the combined effort of laboratory and administrative staff in supplying the information needed for its production. Their help is gratefully acknowledged, as is also the advice and assistance of the Publications Editor in preparing the Report for publication.

The PHLS: What it is and What it Does

LEGISLATIVE BACKGROUND

In 1945 the Government decided, in view of the outstanding success and growing dependence on the wartime Emergency Public Health Laboratory Service, to put it on a permanent footing as the Public Health Laboratory Service (PHLS), and the Medical Research Council (MRC) agreed with the Ministry of Health to continue their administration of it for a further five years in the first instance. Statutory authority was given by Section 17 of the NHS Act 1946 to the Minister to provide a bacteriological service for the control of infectious diseases.

The PHLS Act 1960 transferred responsibility for the Service from the MRC to a new PHLS Board, established as a statutory body capable of acting in its own right as an agent for the Minister of Health. The Act also transferred the staff from the employment of the MRC to that of the Board and transferred property from the Council to the Ministry.

The NHS Act 1977 (Schedule 3) incorporated the PHLS Board. Part I dealt with the formal constitution of the Board and Part II with staffing and financial provisions. The PHLS Act 1979 extended the Board's powers by allowing it to carry out "such other activities as in the Secretary of State's opinion can be conveniently carried on in conjunction with the Service". The effect of this legislation was to enable the Board to assume responsibility for the administration of the former Microbiological Research Establishment of the Ministry of Defence at Porton Down as a civil establishment, which is now known as the PHLS Centre for Applied Microbiology and Research (CAMR).

The PHLS is administered by a Statutory Board, closely analogous to a Regional Health Authority or a Special Health Authority but funded from the central funds of the DHSS. It is an integral part of the National Health Service and has responsibility extending over the whole of England and Wales. The staff receive the same rates of pay as those employed in the NHS, which may only be varied by direction of the Secretary of State, and are required to join the NHS Superannuation Scheme. The Board's staff formally came within the purview of the Health Services Whitley Councils on 1 March 1981. The Board has Management representatives on the PTA and PTB Councils.

STRUCTURE

The PHLS comprises 52 regional and area laboratories distributed throughout England and Wales (see Figure 1), and 24 reference and special laboratories or units, most of which are grouped in the Central Public Health Laboratory, Colindale, North London (CPHL), or at the PHLS Centre for Applied Microbiology and Research, Porton Down, Wiltshire (CAMR).

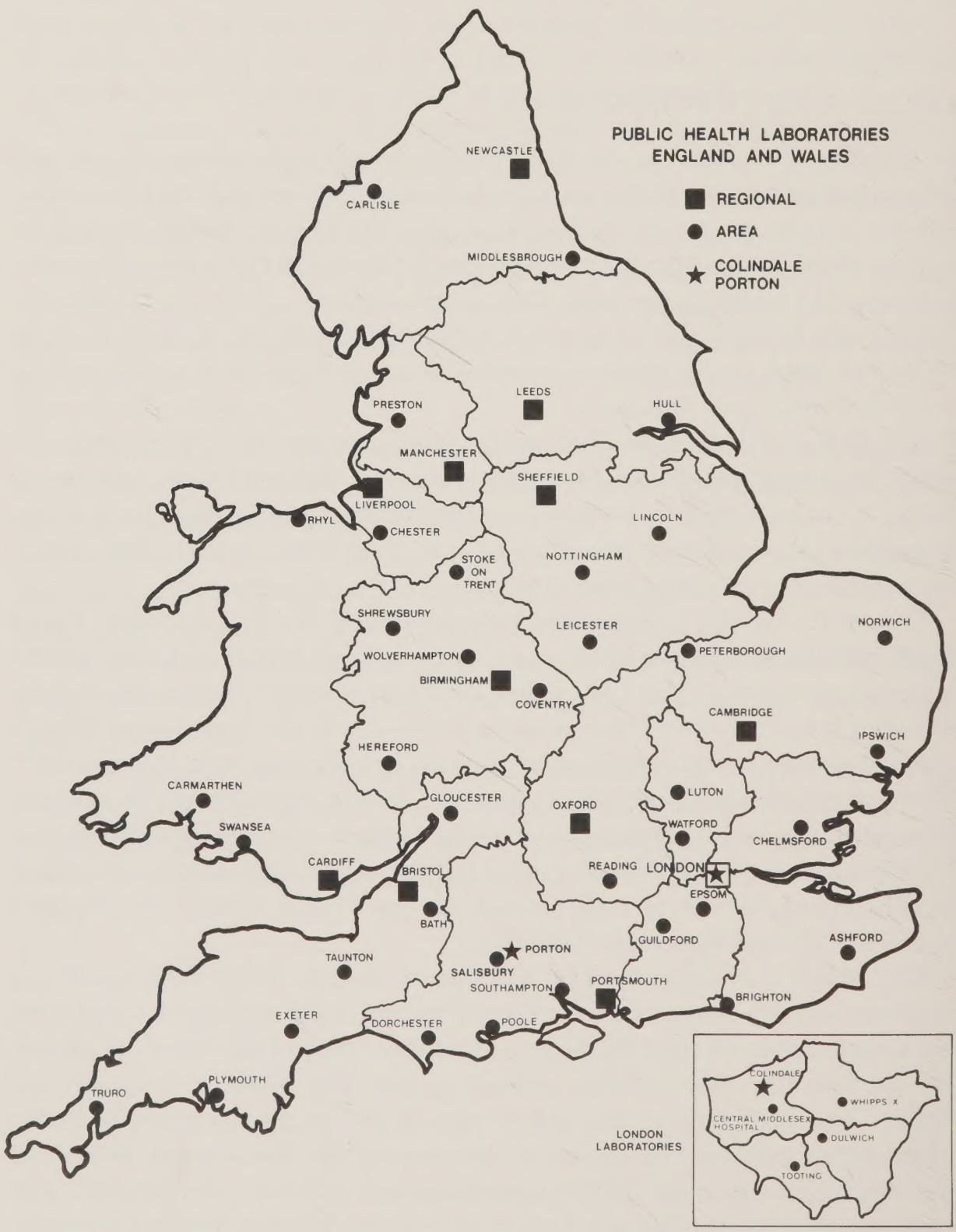

Figure 1 Map showing the geographical location of PHLS laboratories.

FUNCTIONS

The PHLS operates as a network of centrally co-ordinated laboratories in accordance with its statutory obligations both to provide a microbiological service for the diagnosis, control and prevention of communicable diseases and to develop applications of biotechnology mainly, but not exclusively, in the health field. It carries out these obligations by giving a routine microbiological service to several hospitals, and providing reference facilities that are available nationally. It collates information on the incidence of infection, and when necessary it institutes special enquiries into outbreaks and the epidemiology of infectious disease, although executive responsibility for their control is the statutory responsibility of local authorities. It also undertakes bacteriological surveillance of the quality of food and water for local authorities and others. The PHLS is often called upon to advise central and local government and the hospital service on many aspects of infectious disease. It maintains close contact with veterinary organizations in areas of mutual interest, and collaborates with the World Health Organization and with national laboratory and epidemiological services overseas. Particularly at CAMR there is collaboration with commercial organizations on ways of applying microbiological expertise to industrial developments.

ROUTINE DIAGNOSTIC MICROBIOLOGICAL SERVICE

Nearly all of the regional and area laboratories are situated in or are closely associated with hospitals, providing them with their routine clinical microbiological service. They also serve general practitioners, Medical Officers for Environmental Health, other doctors caring for communities and Environmental Health Officers. By means of this continuous sampling the PHLS monitors the infections which bring patients to hospital or which attack them while they are there, as well as becoming aware of the distribution of communicable disease in the community.

REFERENCE AND SPECIAL FACILITIES

Most of the regional and some of the area PHLS laboratories carry out special tests for neighbouring PHLS and NHS laboratories. All PHLS laboratories are available to assist local hospital laboratories in investigating outbreaks of infection, if asked to do so.

Further back-up facilities are provided by the reference laboratories or units which carry out various tests for the PHLS and hospital laboratories throughout the United Kingdom. These tests usually require special expertise, techniques and facilities which it would be uneconomic or impossible to provide more widely. As well as carrying out special tests such as the "fingerprinting" of organisms for epidemiological purposes,

reference laboratories conduct research and act as sources of advice on many aspects of the control of communicable disease.

The PHLS laboratories at Colindale and Porton Down develop and produce therapeutic, prophylactic and diagnostic materials for use by the NHS and others, as well as by the Service itself. They also monitor a few commercially available reagents and provide test materials to PHLS and hospital laboratories to enable them to assess the quality of their routine performance. The National Collection of Type Cultures (of bacteria of interest to medicine) is a constituent part of the Central Laboratory at Colindale.

DISEASE SURVEILLANCE AND CONTROL

A special unit at Colindale, the PHLS Communicable Disease Surveillance Centre, analyses information about the whole range of infectious diseases from the regular reports they receive from the PHLS, hospital laboratories and other sources. These data form a continuously changing, up-to-date picture of communicable disease throughout the country. This is published weekly in the *Communicable Disease Report*, which is issued to microbiologists, community physicians and others concerned with disease control, supplementing information available from the statutory notifications and other sources. In addition to gathering information, the Centre co-ordinates the investigation and control of incidents of communicable disease of national importance and of outbreaks involving many local authorities.

A unique feature of the PHLS is the regular meeting together four or five times each year of the heads of its laboratories to exchange information and discuss technical matters. It is thus enabled, at short notice, to call on the very wide range of knowledge and ability available among its nationally distributed specialist staff. Working parties with appropriate skills can be formed to tackle new problems, as they arise, achieving the highest probability of producing a speedy and useful result. There have been several examples of this system operating in recent years, to the considerable benefit of the community.

The Epidemiological Research Laboratory undertakes surveillance of the effectiveness and safety of many of the immunization programmes in current use, and evaluates new immunization procedures.

RESEARCH

Most PHLS laboratories are engaged in some research, and many regional laboratories, and especially the reference and special laboratories, have extensive research programmes. CAMR in particular has a substantial programme of research and development in the sciences underlying biotechnological processes and their application. The Service has a number

of committees which organize collaborative research projects and arrange for the testing of new ideas and methods.

SURVEILLANCE OF FOOD AND DRINK

All regional and area laboratories provide a microbiological service to local authorities for the examination of water, milk and, increasingly, other foodstuffs, including imported foods examined at the port of entry or centre of distribution. Raw foods, in particular meat and poultry, and animal feeds known to spread agents of food poisoning are monitored to trace the origin and transmission of these organisms. Food-poisoning bacteria are studied in relation to their survival or multiplication in foods and preventive measures are suggested in the light of results. Laboratories are often called on to examine foodstuffs in the course of investigating outbreaks of infection and they may be invited to advise manufacturers.

ACCEPTANCE OF SPECIMENS

The material examined in PHLS laboratories comprises "clinical" specimens (throat swabs, blood, faeces, etc.) from persons suspected of suffering from microbial disease, or of being carriers of pathogenic microbes, and non-clinical ("sanitary") specimens, such as food and water, submitted either as part of an epidemiological investigation or for routine public health surveillance.

Clinical specimens must be submitted by medical practitioners, veterinarians, dentists or those acting directly on their behalf. Clinical specimens are not accepted from other private persons.

Sanitary specimens can be submitted by Medical Officers for Environmental Health and Environmental Health Officers (or members of their staff) acting on behalf of the local authorities. The PHLS is always ready to give advice to food manufacturers and distributors; however, although it may carry out limited microbiological investigations related to an inquiry, it does not ordinarily undertake routine examinations for commercial organizations.

The reference and special laboratories receive only specimens sent from other laboratories. Their services are available to all PHLS, NHS and other official laboratories in the United Kingdom.

Statement by the Chairman of the PHLS Board

Two major preoccupations of the Board during the year were the further reductions in the funding received from the DHSS and the entry into official negotiations over the commercial development of the research output of CAMR. Both matters made substantial additional demands on the time of individual members of the Board whose expert advice and assistance I gratefully acknowledge.

In last year's Report I referred to the Board's four Strategic Review Working Parties, each of which had been set the task of surveying a broad area of the work of the PHLS. This was done as the necessary preliminary to the reallocation of any resources that might become available through withdrawal from or reduction of activities considered to contribute least to the Board's objectives. This plan never came to fruition, for just as the Board was considering the reports of its Working Parties, a succession of financial cuts were notified to the PHLS. The first followed the Chancellor of the Exchequer's July statement and was for £377 000 in the year 1983/4. The second, notified in August, and covering the years 1984/5 to 1986/7 was a 1 per cent annual cumulative reduction amounting to £300 000 rising to £900 000, described as an "efficiency saving", as distinct from the subsequent 2.2 per cent reduction announced in November amounting to £690 000 for 1984/5, categorized as "equal misery for all (the central services)". These cuts, together with other commitments, meant that the Board was faced with finding savings of £377 000 in 1983/4, £1.5 million in 1984/5, £1.5 million in 1985/6 and £2.1 million in 1986/7.

It was immediately apparent to the Board that the magnitude and duration of these latest "adjustments" to its funding were such that the economy measures adopted up to this point to contain expenditure within the previously reduced cash limits – the "freezing" of vacant posts, deferment of building maintenance and "good housekeeping" economies – were totally inadequate in these new circumstances and that some loss of posts was inevitable if the required reduction in expenditure was to be achieved. As a first step the Board drew up a statement of its policy on employment. This set out the principles that the Board would follow when a post had to be lost and was distributed to laboratory directors for information of their staff; it was also distributed to the trade unions and staff associations.

In view of the potential seriousness of the decisions to be taken, the Board endorsed my view that it should be advised by a small group of four Board members (the Expenditure Review Group) led by the Deputy Chairman, Mr C. C. Stevens, whose experience of PHLS affairs extends back to the time when the Board was first established as a statutory body. The Group had to proceed rapidly with its deliberations and, given the nature of its task, in strict confidence. An overriding consideration was the need to take maximum advantage of any reductions of staff resulting from natural wastage or from the application of the recently introduced arrangements for voluntary premature retirement of those over 50 years of age. Rather than adopt simple "across the board" reductions which would have penalized unfairly the under-resourced parts of the Service, while leaving those better provided less affected, the Expenditure Review Group has favoured a selective, "value for money" approach (value in this context meaning value of the activity to the statutory responsibilities of the Board).

The Group has recommended and the Board has accepted several harsh and painful economies touching all parts of the PHLS, although the implementation of some relating to CAMR has been delayed at the request of Ministers while negotiations over its commercial future are in progress. With an estimated deficit of £2.1 million in prospect by 1986/7, the Expenditure Review Group can be expected to recommend further and more stringent measures to achieve the necessary savings in expenditure.

Towards the end of 1983 I was approached, as were the Director of CAMR and Ministers, by the Chairman of a group of companies with interests in biotechnology about the possibility of the Board entering into an agreement for the commercial development and exploitation of the products, processes and services of CAMR. A preliminary study of the proposal submitted was made with the assistance of a Board member (Mr D. F. R. Crofton), whose background in financial matters proved invaluable in this exercise, and with officials of both the DHSS and the DTI. There followed a series of exploratory meetings between myself, Mr Crofton, the Board's officers and Departmental officials, the conclusion of which was that the proposal appeared sufficiently attractive to merit serious consideration by the Board. For this purpose, authority was given by the Board at its meeting in January 1984 to a small group of members chaired by myself (the Executive Group), to take decisions on behalf of the Board on commercial matters, should this prove necessary between the regular meetings of the Board. This has since proved to be a wise precaution, for it has enabled the momentum of negotiations to be maintained.

I have dwelt at some length on these two matters which have preoccupied the Board and its officers not only because of their intrinsic importance to the Service but also to illustrate the extent to which members of the Board are directly concerned in the management of its affairs – an aspect which can hardly have escaped the notice of the team of staff inspectors of the DHSS who are conducting a review of the PHLS at the behest of the Management and Personnel Office of the Treasury. In this context it has been suggested to

me that the Board should delay implenting the proposals of the Expenditure Review Group until the outcome of this review is known. This suggestion presupposes that cash limits can, in these circumstances, be exceeded with impunity – most assuredly they cannot!

The Parliamentary Under-Secretary of State for Health, Lord Glenarthur, visited Colindale (CPHL, CDSC and Headquarters) and CAMR at Porton Down during the year. The visit to CAMR helped to convince the Minister that the Centre needed a new fermentation pilot plant subject to funds being made available from the Treasury.

I wish to congratulate Professor O'Grady on his appointment as Commander of the Order of the British Empire in the New Year's Honours and to thank Mr F. J. Aldridge, Dr T. H. Flewett, Dr I. Gregg, Dr W. G. Harding and Professor J. A. Scott, who retired from the Board on 31st July 1983, for the valuable service they gave during the term of their appointments. Simultaneously I welcome in replacement Mr A. E. Eames, Dr A. P. Haines, Dr M. Sackwood and Professor A. J. Zuckerman as new members of the Board.

The period of office of Mr B. S. Chessum as Head Medical Laboratory Scientific Officer Staff Assessor to the Board expired during the year. He was succeeded by Mr B. Gee, Head MLSO of the PHLS laboratory at Coventry.

C. E. Gordon Smith

Public Health Laboratory Service Board

Membership of the Board is given at 30 November 1984.

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Dean, London School of Hygiene and Tropical Medicine

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D. F. R. Crofton, BComm, FCA, ACIS

J. R. Hepple, BSc

A. G. Taylor, PhD (Staff Assessor to the Board)

Report of the Director of the Service

The Routine Work of the Service

Despite its preoccupation with reviews, external and internal, and with tightening cash limits, which has characterized the year, the PHLS has continued to meet, if not all the demands placed on it, at least those that really matter. It is a tribute to the resilience of the staff that this was achieved simultaneously with a significant expansion in many areas of the routine work of the Service, as the following account shows.

EXAMINATION OF SPECIMENS BY REGIONAL AND AREA LABORATORIES

During 1983/4 the work of the 52 area and regional laboratories, measured by specimens examined (Table 1) rose by 6.4 per cent compared with the previous year. One per cent of this rise was accounted for by extra serological testing attributed to the DHSS rubella immunization initiative, which developed into the National Rubella Campaign under the patronage of HRH The Princess of Wales. The remaining 5.4 per cent represents an increase in general workload during the year which was greater than had been recorded for any year since 1978, when there was an increase in 7.5 per cent over 1977.

Fifty-six per cent of the extra specimens examined in 1983/4 came from patients of general practitioners, and increase of 15 per cent in work from this source compared with 1982/3. Specimens originating from patients in hospital accounted for 45 per cent of the increase, their number rising by only 4 per cent compared with the previous year. The trend towards an increase in work from general practice noted in the last Report thus continues; hospital specimens now account for 68 instead of 70 per cent of the total and general practice for 26 rather than 24 per cent. Other work (mostly environmental) fell a little, but remained at about 6 per cent overall.

Among specimens reduced in number by comparison with the year before were those sent for examination for tubercle bacilli (down 5 per cent), for the diagnosis of disease in animals (64 per cent) and of water, milk, cream and ice cream (7 per cent) and food (4 per cent). Notable among those that increased were urine specimens (8 per cent up), other general

Table 1 Specimens examined in regional and area laboratories, 1983/4

Source	Examination	No. of specimens	Totals
Human	For bacteria		
	In urine	2 048 868	
	For tubercle bacilli	154 175	
	For other bacteria and fungi	2 483 247	4 686 290
	For chlamydia and viruses (including by electron microscopy)	285 519	285 519
	Antigen–antibody detection		
	In venereal diseases	400 975	
	In bacterial diseases	130 904	
	In viral and other diseases	1 053 239	1 585 118
	Antimicrobial assays	34 424	34 424
Animal	Diagnosis of disease	1 439	1 439
Food	For microbial contamination		
	Water, milk, cream, ice cream	153 097	
	Other foods	39 283	
Other environmental specimens		89 126	281 506
Various reference specimens		78 529	78 529
			6 952 825

bacteriological specimens (6 per cent), virology specimens (16 per cent) and viral serology including that for rubella (10 per cent). The continuing growth of virology underlines the increasing appreciation of the usefulness of laboratory techniques for the diagnosis of viral disease. This tendency makes it necessary to point out that unit costs in virology are in general greater than those in bacteriology, so producing an accelerating pressure on scant resources.

PRODUCTIVITY

From 1977, the first full year in which PHLS regional and area laboratories existed in their present number, to 1983/4, specimens submitted to them have increased by 33.6 per cent. Over the same period, staff numbers in the laboratories concerned have fluctuated between 2064 in 1977 and 2134 in 1983/4, an increase of only 3.4 per cent. Productivity expressed as the annual total of specimens examined by each staff member has risen from 2521 to 3258, or by 29.2 per cent as illustrated in Figure 2. It is a matter for some satisfaction that during a period of increasing financial stringency, it is possible to show that nearly all the 33.6 per cent additional work received by

laboratories since 1977 has been accommodated by this increased productivity.

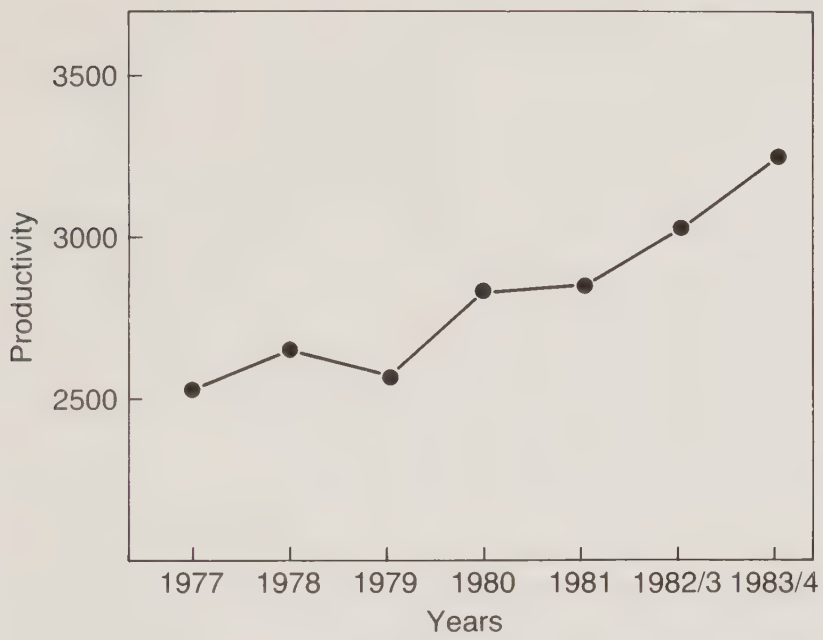

Figure 2 Productivity in PHLS laboratories, measured in terms of the number of specimens examined per staff member (all staff) in regional and area laboratories. (Data from PHLS Annual Reports: although these reports related to fiscal years after 1978, specimen numbers were still counted by calender year until 1981.)

In the last Report, it was argued that at least a proportion of the continuing rise in specimen numbers – a reflection of the national experience – might be attributed to increased productivity in hospitals, which has paralleled that in laboratories. This trend is now documented in Figures 3 and 4, which show that there was a 12 per cent improvement between 1977 and 1982 (the last year for which data are available) as measured by the reduction in the average length of time a patient spends in an acute hospital. This must be viewed against an increase in PHLS laboratory workload of 26 per cent over the same period.

The increase in hospital "productivity", as defined, has a comparatively small effect on the cost of providing hospital hotel services, a moderate effect on the cost of most routine clinical activities, and a much more profound effect on the cost of certain services, such as those provided by operating and radiology departments, and by pathology laboratories. Because laboratory investigations, X-rays and operations fall most heavily into the first few days of the time the average patient spends in hospital, the effect of an increase in patient turnover falls disproportionately and exponentially on these service areas. This has important implications for funding, particularly for the PHLS which, as it is limited to providing a laboratory service, has no means of cushioning this disproportionate loading by the transfer of funds from other activities.

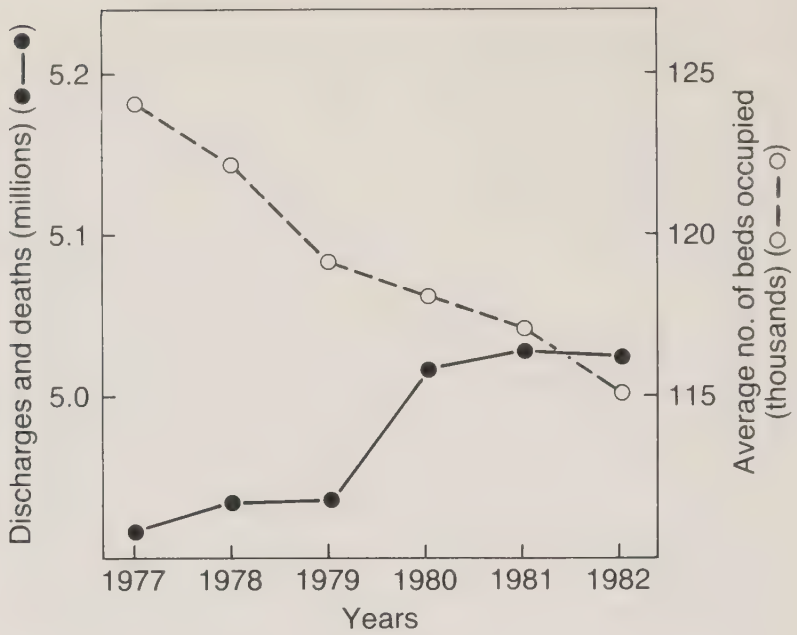

Figure 3 Productivity in acute hospitals, measured by the number of beds occupied daily and the number of patients in them, by year. (Data from various official sources: data are for England only for acute beds, i.e. non-psychiatric specialities, also excluding geriatric beds and beds for the young disabled.)

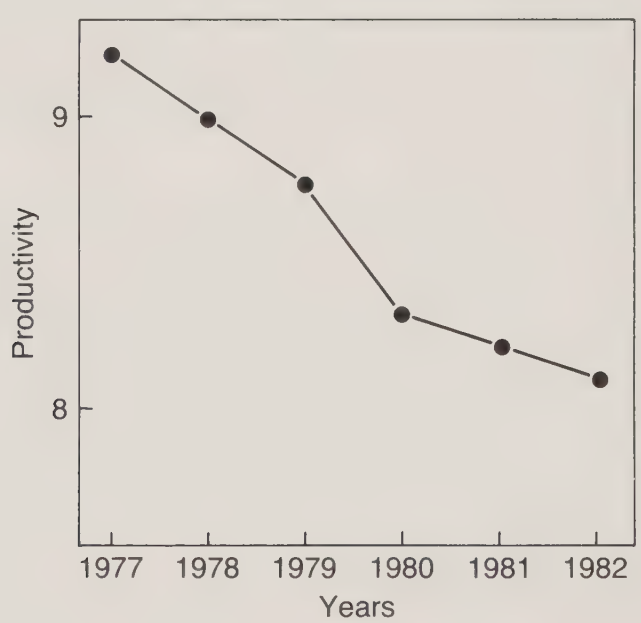

Figure 4 Productivity in hospitals, measured by the average length of stay of patients in acute hospital beds, by year. (Data from various official sources: data are for England only for acute beds, i.e. non-psychiatric specialties, also excluding geriatric beds and beds for the young disabled.)

SOME COMMON FEATURES

Pressure on resources The continuing reduction in the funding of the PHLS, to which the Chairman of the Board refers in his statement on page 9, is a matter of intense concern to the directors of the regional and area laboratories. It is in these laboratories, where the immediate service is given

by the PHLS to doctors in charge of patients, whether in hospital or in the community, that the effects of the cutbacks are felt most acutely. To begin with, it can be a salutary experience to order priorities and to assess which tests are likely really to matter in the investigation of communicable diseases, but as the economies bite deeper the morale of the professional staff of the laboratories begins to suffer, for it is daily borne in on them that they are no longer able to provide the level of service which, in their judgement, they should be able to offer.

Most laboratories have tried to discourage the submission of the least contributory specimens by local educational exercises, aimed principally at junior hospital medical staff, but few report success. One of the difficulties encountered is the frequency with which junior hospital medical staff change; another is that a proportion of specimens are originated at second hand by nursing staff. Whether the situation will be remedied to any extent by the proposed introduction of "clinical budgeting" in hospitals remains to be seen.

The economies to be achieved through rationalization of expensive services, such as virus isolation, are often more apparent than real when account is taken of all the activities needed to register, prepare and transmit a specimen in a suitable condition to a distant laboratory and to record and send out the subsequent report. The decline in the need for animal inoculation has led to the closure of six animal houses since 1980, but as most had been scarcely used in recent years, the resultant savings were, likewise, less than might at first be expected.

Dysentery Several laboratories reported an increase in the number of isolations of *Shigella sonnei*, a dysentery bacillus long familiar as the cause of a mild form of dysentery, usually among children of nursery school and primary school age, but relatively quiescent in recent years. In Hull, following the arrival of two infected families, *Sh. sonnei* spread widely in schools and the laboratory detected 1350 cases in 12 months, in the course of which some 60 000 specimens were examined.

Amoebic dysentery tends to be thought of primarily as a tropical disease, although the causative organism, *Entamoeba histolytica*, is occasionally encountered in this country. Such proved to be the case in a residential home for educationally subnormal adolescents in Plymouth in which a 13 year old boy suffering from diarrhoea was found to have this infection, as were five other residents, one nurse and one domestic worker.

Hepatitis B and drug abusers Several laboratories encountered instances of the now well recognized association of hepatitis B virus infection with self-injection of narcotic drugs. In one town the detection by the laboratory of 50 cases of hepatitis B, two of which were fatal, led to the identification of an unsuspected circle of heroin addicts and the subsequent opening of an addiction day centre. The Manchester laboratory, with the co-operation of the Virus Reference Laboratory, found five cases of delta agent infection

among 52 cases of drug-associated hepatitis B. The delta agent is a small virus discovered recently in some cases of hepatitis in association with the hepatitis B virus, and the dual infection carries a worse prognosis. Epidemiological information showed that the individuals infected with the delta agent may have acquired their infections in Scotland or Ireland.

Antibiotic resistance in Staphylococcus aureus A recrudescence of infections by this microbe, which is a common cause of boils and other septic infections, is revealed by reports from many laboratories of strains of this organism resistant to the newer penicillins and many other antibiotics also. Multiply antibiotic-resistant *Staph. aureus* infections were prominent in the 1970s and had been thought largely to have died away. As before, the infection has spread mainly, but not exclusively, among the elderly; carriage of this organism by hospital staff has added to the difficulty of control. The resurgence of this microbe is the subject of the article on page 56 by Dr E. Mary Cooke.

Meningococcal meningitis Most of the regional and area laboratories can expect to encounter a few sporadic cases of this infection in the course of a year. Two laboratories, however, had outbreaks to contend with which generated much local concern. Since 1982 in Gloucester there have been 41 cases, nearly all in teenagers and adults; there was one death. In Plymouth there were 23 cases and four deaths. In both outbreaks the epidemic strain was shown with the help of the reference facilities of the Manchester laboratory to be the same, a sulphonamide-resistant Group B, type 15 strain, which predominantly affected teenagers and which has been on the increase in recent years (see Figure 5).

Private water supplies EC Directive 80/778 on the quality of water intended for human consumption, full compliance with which is required of the United Kingdom by July 1985, lays down more ambitious requirements on the frequency of sampling and range of analyses than has been the accepted practice in this country. The technical requirements of the Directive are considered in *The Bacteriological Examination of Drinking Water Supplies 1982*, a joint publication by the PHLS, the DHSS and the DOE. Already, however, the implications of this Directive are evident in the increasing number of water samples now being received by laboratories from small private supplies.

USE OF REFERENCE LABORATORIES AND SPECIAL SERVICES

The reference and special laboratories and units of the PHLS, besides supporting the regional and area laboratories of the Service, make their specialized knowledge and experience available to NHS and other laboratories not only in England and Wales but throughout the United

Figure 5 Maps showing outbreaks of meningococcal meningitis in 1983, by quarters. The outbreaks in Plymouth and Gloucestershire are clearly indicated: (a) January–March; (b) April–June; (c) July–September; (d) October–December. Solid circles (•) indicate sulphonamide-resistant strains of *Neisseria meningitidis*; open circles (o) indicate sulphonamide-sensitive strains.

Kingdom, as is evident from Table 2, which shows the numbers and sources of specimens examined by the reference laboratories of the Central Public Health Laboratory, Colindale. Although there are approximately six times as many NHS as PHLS laboratories in England and Wales, the numbers of specimens submitted from NHS sources to the reference laboratories at

Table 2 Specimens examined at the Central Public Health Laboratory, Colindale, during the year ending 31st March 1984

Laboratory and specimen type	Sources of specimens			
	PHLS	NHS	Other UK	Foreign
Division of Enteric Pathogens				
Cultures	11 987	11 794	4349	2201
Sera	13	5	–	–
Division of Hospital Infection				
Cultures (staphylococci)	1 898	10 250	435	80
Cultures (streptococci)	2 736	2 834	27	292
Cultures (Gram-negative bacilli)	1 460	1 600	45	18
Sera	1 642	1 852	76	–
Division of Microbiological Reagents and Quality Control				
Cultures	83	116	1	8
Sera	588	348	14	81
Other	7	3	–	1
Food Hygiene Laboratory				
Cultures and/or specimens	2 251	1 077	317	415
National Collection of Type Cultures				
Cultures	123	154	6	113
Virus Reference Laboratory				
Cultures	521	300	35	195
Sera	4 721	5 961	416	2151
Other	266	226	31	19

Colindale exceeded those from PHLS sources by only 29 per cent. Reference facilities are, of course, not confined to Colindale, the numbers of specimens examined by designated laboratories and units are shown in Table 3.

SURVEILLANCE OF INFECTION

To build up a comprehensive picture of communicable disease in England and Wales, the PHLS Communicable Disease Surveillance Centre (CDSC) at Colindale gathers information in the form of reports from PHLS laboratories, which contribute about half the volume of data received by the Centre, and from the six times more numerous NHS laboratories. In addition data are sought from other sources such as statutory notifications, general practitioner reports and hospital reports. To facilitate the integration of the various categories of data, an additional consultant post at CDSC was created jointly between the Office of Population, Censuses and

Table 3 Specimens examined by reference and special laboratories and units during the year ending 31st March 1984 (excluding the Central Public Health Laboratory)

Laboratory and type of specimen examined	Nos. examined
Special Pathogens Reference Laboratory	
Arboviruses	
Virus isolation	37
Serology	596
Viral haemorrhagic fevers	
Virus isolation	36
Serology	263
Rickettsias	
Serology	325
Environmental Microbiology and Safety Reference Laboratory	
Vibrios	
Cultures for identification	300
PHLS Anaerobe Reference Unit	
Anaerobes	
Cultures for identification	579
Cl. difficile	
Specimens for detection of toxin	257
PHLS Leptospira Reference Unit	
Leptospirosis	
Serology	3 003
Specimens for isolation	451
PHLS Malaria Reference Laboratory	
Malaria parasites	
Blood films for microscopy	1 068
PHLS Mycological Reference Laboratory	
Pathogenic fungi	
Cultures for identification	1 607
Specimens for isolation	128
Serology	2 954
PHLS Mycobacterium Reference Unit	
Mycobacteria	
Cultures for identification	3 190
Specimens for isolation	14 401
PHLS Mycoplasma Reference Laboratory	
Mycoplasma pneumoniae	
Serology	1 363
Other mycoplasmas	
Cultures for identification	325
Tissue cultures suspected of contamination	118

Surveys (OPCS) and the PHLS Board. The OPCS and CDSC have already combined to publish an annual return of statistics relating to communicable disease as the *Annual Review of Communicable Diseases*. The circulation of the weekly *Communicable Disease Report* has increased to nearly 5000.

During the year some 30 major field investigations were undertaken by the epidemiologists of the Centre with their microbiological colleagues and some of the more interesting are related below.

NOTABLE COMMUNICABLE DISEASES 1983/4

The emergence of the acquired immune deficiency syndrome (AIDS), the identification of parvovirus as the causative agent of an outbreak of erythema infectiosum ("fifth disease"), the fresh manifestation of haemolytic uraemic syndrome, the first reports of cryptosporidiosis in human beings, the occurrence of "airport malaria", imported typhoid fever and shipborne gastroenteritis were notable features of 1983.

Acquired immune deficiency syndrome In 1981 an outbreak of an unusual form of pneumonia due to *Pneumocystis carinii* was reported in homosexual men in the United States of America (USA). This organism is most often encountered as an opportunistic pathogen of the respiratory tract of patients whose immune mechanisms are impaired. At about the same time, an undue prevalence of a rare type of malignant tumour (Kaposi's sarcoma) in homosexual men was described, also in the USA. An apparently new syndrome was defined by the Centers for Disease Control, Atlanta, and became known as the acquired immune deficiency sydrome (AIDS). In 1982 a surveillance system was set up in the UK to detect the syndrome and to monitor trends. The system comprised, first, clinical reports of suspected cases from venereologists and other clinicians, second, laboratory reports of infections due to opportunistic pathogens, and third, death certificates in which Kaposi's sarcoma or AIDS was mentioned, provided by the Office of Population, Censuses and Surveys.

By the end of 1983, 40 cases conforming to these criteria had been reported to CDSC, 22 of which were fatal. Fifteen patients had Kaposi's sarcoma, 13 had pneumonia due to *Pneumocystis carinii,* two had both conditons, and 10 had other opportunistic infections. Thirty-seven patients were males, 33 of them under the age of 50, and three patients were females, two of whom were African. Thirty-three of the patients were homosexual or bisexual males and two were haemophiliacs; in the remaining five no risk factors could be identified. Twenty-seven of the cases reported were in the London area, a further six in the south of England, two in Wales, two in Oxford and three in the north-west. Most had had contacts with Americans or had visited the USA or Caribbean, although a few patients appeared to have acquired the disease in the United Kingdom.

Erythema infectiosum ("fifth disease") Erythema infectiosum is a mild, feverish illness with a rash which has a "slapped cheek" appearance and which occurs mainly among children. The disease had for long been thought to be caused by a virus but none had been identified. In May 1983 an outbreak of the disease was reported in two primary schools in north-east London. Investigation by questionnaire revealed that over 150 of 650 pupils were affected. In 36 cases investigated virologically the illness was shown to be associated with infection by parvovirus. This small round virus was discovered in 1975 during work on hepatitis at the Virus Reference Laboratory, Colindale, and has since been shown to be linked with episodes of bone marrow failure in persons with "sickle cell" abnormality of the red cells. Pre-existing antibody to parvovirus was found to correlate with protection against the disease in 16 of 17 close family contacts studied. The disease is described in more detail on pages 58–61.

The haemolytic uraemic syndrome This syndrome is characterized by acute failure of the kidneys, scarcity of the blood platelets and a form of anaemia. It was first described in 1955 and cases have since been reported from many parts of the world. The disease occurs mainly in children and has been associated with many different microbial infections. It occurs characteristically in the summer months, and geographical and temporal clusters have occasionally been reported.

In the summer of 1983, CDSC received reports of 39 cases, 19 of which were in the West Midlands region. Fifteen of the West Midlands patients became ill between the 12th and the 29th of July and all were clustered to the west of Birmingham. Thirteen were children and two of the children and one adult died. An epidemiological investigation in co-operation with Medical Officers for Environmental Health failed to reveal a common factor. However, collaborative studies between the PHLS laboratory at Wolverhampton and the Division of Enteric Pathogens, Colindale, showed an association of the disease with infection by an unusual, toxin-producing strain of *Escherichia coli*, similar to one reported in cases of the disease in North America.

Cryptosporidiosis *Cryptosporidium* is a protozoon (single-celled member of the animal kingdom), first recognized in mice in 1907, and subsequently discovered to infect several animal species. It was not thought to be of veterinary importance until the 1970s when it was shown to be associated with diarrhoea in calves. Thereafter a few human infections were reported, the most serious occurring as chronic, life-threatening diarrhoea in immunologically compromised patients. In 1983, however, it became apparent that cryptosporidiosis in man night be a common cause of acute, self-limiting gastroenteritis in normal patients. Improved laboratory techniques led to the detection of 61 cases which were reported to CDSC in 1983. The illness has an incubation period of about a week and gives rise to a febrile illness with diarrhoea and abdominal pain, flatulence and, less often,

nausea and vomiting. Of the 61 cases, three-quarters were in persons under 15 years of age; 53 had gastrointestinal symptoms but in only 13 was information about the possible sources of infection obtained. Two were said to be associated the pets or farm animals, two were possibly infected abroad, and in seven there was a possible spread within families. In two adults, who were nurses, occupational infection was suspected.

"Airport malaria" In the 1970s several cases of malaria were reported in France in which there was a possibility that infected mosquitoes brought back from tropical Africa by aircraft had transmitted malaria by biting persons who worked on or lived near international airports. Cases were subsequently reported in Switzerland, the Netherlands and Belgium, most of them due to *Plasmodium falciparum*, the species of malarial parasite most often responsible for severe forms of the disease. "Airport malaria" was not reported in the UK until the summer of 1983 when four cases came to light, all of falciparum malaria. Two of the patients had been on holiday in Italy, where there is no malaria, and had travelled by air from Rome to London (Heathrow). It was thought that they might have been infected by the bite of a mosquito trapped in aircraft which had previously travelled from malarious areas. The other two cases were near London (Gatwick): one of them was the landlord of a public house near the airport which was patronized by aircrew returning from flights from West Africa. A possible mode of infection was that an infected mosquito had been conveyed from West Africa by air and thence to the pub, trapped in the clothing or hand-baggage of one of the aircrew, and then to emerge and bite the publican and so transmit the disease (falciparum malaria). The other case occurred near Gatwick. The patient was the wife of an aircraft upholsterer who, it was suspected, might have brought home in his clothing an infected mosquito transported from West Africa in one of the aircraft in which he had worked.

An international outbreak of typhoid fever In the latter part of July 1983, 32 British tourists who had returned from holidays at an hotel in Kos, a small Greek island, developed typhoid fever. *Salmonella typhi* was isolated from all of them. Subsequently 24 cases due to the same strain, also in tourists who had stayed at the same hotel, were reported from other European countries, mainly Finland, Norway and Sweden. With the help of many Medical Officers for Environmental Health, all the known British cases were interviewed and found to have stayed at the hotel in the week ending on the 5th of July. A control group was therefore selected from 118 British tourists who had stayed at the hotel during this period and an investigation was carried out by questionnaire. The analysis revealed that salad consumed at dinner on the 4th of July was the most likely vehicle of infection. Subsequently, the Greek health authorities identified a chronic typhoid carrier and his typhoid bacillus, when typed by the Division of Enteric Pathogens at Colindale, was shown to be the same type as the other strains

from this outbreak. It seemed likely, therefore, that the outbreak was caused by this carrier, but the Greek authorities were unable to discover how he contaminated the salad served on the 4th of July.

Shipborne gastroenteritis During 1983 at least 85 cases of *Salmonella java* infection were reported in the passengers and crew of a cruise liner on four successive cruises from Southampton. So far as is known only one of the affected persons was seriously ill; he had a septicaemic illness but recovered satisfactorily. Screening of crew members revealed two excreters who handled food on the ship but whether their infections were the cause or the result of the outbreak is not known. Subsequently a controlled epidemiological investigation was carried out which suggested that poultry might have been the vehicle of infection. This outbreak, coming on top of previous episodes, led to the proposal that there should be a national scheme for the surveillance of gastrointestinal illness on cruise liners conducted jointly by the Sea and Airport Health Association, PHLS laboratories and CDSC.

SURVEILLANCE OF VACCINATION AND IMMUNIZATION

Lead responsibility in this area of the work of the PHLS is taken by the Epidemiological Research Laboratory at Colindale and investigation of the long-term efficacy and safety of the immunizing agents used widely in Britain was continued. Two large studies made over several years were concluded: a comparison of post-vaccination symptoms after primary immunization with either diphtheria–tetanus–pertussis or diphtheria–tetanus vaccine, and an assessment of the risk of infection to patients from surgeons and dentists with hepatitis B.

Diphtheria–tetanus–pertussis (DTP) and diphtheria–tetanus (DT) vaccines The symptoms which developed after primary immunization of approximately 10 000 infants with the two vaccines were compared. Minor symptoms were slightly more frequent with DTP than with DT but the incidence of high-pitched screaming or convulsions was similar for both vaccines.

Transmission of hepititis B to patients from surgeons and dentists This study was mounted after an outbreak in which a surgeon had been found to have infected a few patients. It was based on laboratory reports of acute hepatitis B to the PHLS *Communicable Disease Report* and involved collaboration of microbiologists, physicians and directors of blood transfusion centres throughout Britain. The results, which confirmed previously esablished incidence rates of acute hepatitis B among surgeons and dentists, show that transmission to patients from carriers of the infection practising these specialities in Britain is rare.

PRODUCTION OF THERAPEUTIC SUBSTANCES

Human growth hormone By changing the process for extracting this hormone from human pituitary glands removed *post mortem*, the Therapeutic Products Laboratory at CAMR, Porton Down, has been able to increase the yield. This has enabled the laboratory to supply centres in the UK with 20 per cent more of the natural hormone than last year. It is used for the treatment of children whose growth is restricted as a result of pituitary deficiency.

Thyroid stimulating hormone (TSH) An experimental batch amounting to about 750 IU of TSH was extracted and purified from a side fraction from the human pituitary material. It will be used in a clinical trial for the treatment of thyroid cancer.

Asparaginase The demand for this enzyme, which is used for the treatment of some forms of leukaemia in children, rose by 20 per cent over the previous year. The drug is purified by the Therapeutic Products Laboratory from bulk (400 litre) cultures prepared by the Microbial Technology Laboratory at CAMR. The production process has had to be scaled up to meet the increased demand, exemplified by a 50 per cent increase in the number of hospitals supplied with it since last year.

PRODUCTION OF VACCINES

Tick-borne encephalitis vaccine Production of tick-borne encephalitis vaccine concentrate for Immuno Ltd was continued. The concentrate prepared by the Vaccine Research and Production Laboratory at CAMR, after safety testing, is despatched to Austria for further processing into a vaccine for the protection of persons who may be exposed to ticks in the forested areas of Central Europe. The ticks in these areas may transmit a virus infection of the central nervous system to humans.

PRODUCTION OF OTHER BIOLOGICALS

Tissue cells Cultures of human diploid and baboon kidney cells were produced at the Vaccine Research and Production Laboratory, CAMR. A total of 11 000 units were sent to PHLS laboratories and 3600 units to other virology laboratories for use in the isolation of viruses.

Large-scale cultures and extracts The Microbial Technology Laboratory carried out 134 cultures, of which 16 were of organisms "genetically engineered" to yield biological products of importance in human and veterinary medicine. Extracts were made from 41 of the cultures.

Microbiological reagents Most of the diagnostic reagents used in the PHLS laboratories are prepared by the Division of Microbiological Reagents and Quality Control at Colindale. In the year under review, 116 litres of bacterial and viral antigens were produced, of which 33 litres were supplied to other than PHLS laboratories. A total of 42 litres of bacterial and viral antisera were made, of which 14 litres were supplied to other laboratories. These amounts are little changed from those of the previous year.

Issue of authentic cultures The National Collection of Type Cultures at Colindale supplied 5090 cultures, of which 19 per cent went to laboratories abroad. The sixth edition of the *Catalogue of the National Collection of Type Cultures* was published during the year.

Issue of immunoglobulin During 1983 a total of 82 473 ampoules containing 250 mg of normal immunoglobulin and 5311 ampoules containing 750 mg of normal immunoglobulin were distributed from the Epidemiological Research Laboratory, Colindale. Much of this was issued, together with advice, by laboratories elsewhere in the PHLS for the prevention of infectious hepatitis (often for persons travelling to countries overseas where there is a high endemic prevalence), rubella and measles. The issues of specific immunoglobulins during 1983 were as follows: hepatitis B, 935 ampoules of 100 mg, 193 ampoules of 250 mg and 2305 ampoules of 750 mg; varicella-zoster (chickenpox), 500 ampoules of 50 mg and 2108 ampoules of 250 mg; mumps, 254 ampoules of 250 mg.

EXTERNAL QUALITY ASSESSMENT OF MICROBIOLOGY LABORATORIES

For some years the PHLS has, on behalf of the DHSS, organized the National External Quality Assessment Scheme for microbiology laboratories in the UK. The Division of Microbiological Reagents and Quality Control at Colindale made 34 distributions, of which nine were for virology, during the year to 474 laboratories in both the public and private sectors in the UK and to 125 laboratories abroad.

The Research Work of the Service

Most of the activities encompassed by this heading are more explicitly described as applied research and development, mainly in medical and environmental microbiology, but with extensions into related areas of biochemistry, molecular biology and genetics, and epidemiology. Nor is research, however defined, the sole perogative of CAMR and CPHL, for nearly every laboratory in the Service has managed, either from within its budgetary allocation or with the assistance of external funds, to continue existing or to mount new projects, modest though some of these necessarily

are. This is a continuance of the practice of the Service which from its earliest days has adopted an investigational approach in its everyday work; in consequence much of the research effort of the laboratories is directed towards developing techniques and extending their application. The maintenance of high standards of laboratory performance depends on continuing assessment of new developments and the assimilation of those that prove their worth. A modicum of research and development, therefore, is seen – by laboratory workers at least – as a justifiable on-cost of providing a routine service.

Table 4 Publications by PHLS staff in 1983

Type of publication and subject area	Number of publications
Articles in journals, books and conference proceedings	
Antimicrobials	56
Cancer research	24
Disinfection	8
Epidemiology	24
Food microbiology	20
Immunology	22
Laboratory safety	15
Specific bacteria and infections	230
Viruses and viral infections	77
Other organisms	33
Techniques	101
Others	45
Total	655
Other publications	
Books written or edited by PHLS staff	9
PHLS publications and reports	28
Other reports	11

A full list of these publications is available from the Librarian at the Central Public Health Laboratory on request.

Some indication of the volume and coverage of PHLS research is to be had from Table 4, in which are listed the number of publications by staff of the Service under main subject headings. This represents only the work coming forward for publication during 1983 and takes no account of work currently in progress, or of long term projects, or of work which for one reason or another is not submitted for publication. To summarize all this activity within the confines of this Report would be impracticable; instead a few examples have been selected to illustrate its nature and extent.

ANTIBIOTICS

Clinical use The proximity to patients and the clinicians who treat their infections probably accounts for no less than 27 of the 52 regional and area laboratories reporting one or more projects relating to the use of antibiotics, chiefly of the many new cephalosporins. In most of these studies the laboratory is contributing microbiological data to a joint project with its local clinicians. The ultimate aim of much of this work is to point the way to a more rational use of antibiotics.

Antibiotic-associated diarrhoea This common and usually mild complication of antibiotic therapy occasionally takes the form of a severe and life-threatening inflammation of the colon that has recently been traced to the effect on the bowel of the toxin produced by an anaerobic bacterium, *Clostridium difficile*. Besides being found in the bowel of affected patients, the organism has been detected in their environment. The significance of these environmental strains in the causation of this condition is uncertain as at present no reliable means exists of distinguishing them from those found in patients. Various typing methods are under development at Cambridge and Manchester; the one at Manchester makes use of bacteriophages, but so far is effective in typing only about 40 per cent of strains. Improvements in methods for the isolation and identification of *Cl. difficile* and detection of its toxin have been published by the Anaerobe Reference Unit at the Luton laboratory.

Transmissible antibiotic resistance The spread of resistance to antimicrobial drugs among bacteria and the mechanisms whereby this occurs have for long been the subject of research in the Divisions of Enteric Pathogens and of Hospital Infection at Colindale. Resistance to trimethoprim among dysentery bacilli was found to have increased substantially during the year and the generic elements responsible for this were identified. Work at the Nottingham laboratory on the spread of resistance to this drug among other bacteria, in particular those causing urinary infections encountered in general practice, points to a similar genetic process.

AUTOMATION AND NEW TECHNOLOGY

Automated screening of blood cultures Following several years' development of the Malthus system sponsored by the DHSS at the Cambridge laboratory, production versions of this equipment are under evaluation for the Department of Trade and Industry at the Oxford, Stoke and Tooting laboratories. At Cambridge, where 2000 specimens for blood culture have so far been compared, the Malthus system, which is based on the measurement of changes in electrical impedance resulting from bacterial growth, detected 50 per cent of positive cultures more than 8 h earlier than the conventional method. However, organisms were detected in 12 per cent more cultures by the conventional system, in which the rate of false positive results was only 1.3 per cent as compared with 15.8 per cent by the prototype automated system.

Monoclonal antibodies The use of these new and valuable reagents in the PHLS, formally confined to laboratories at CAMR and CPHL, continues to grow, as does the range of applications. Nine of the regional and area laboratories report projects in which monoclonal antibodies are being used; at first limited principally to virology, applications now include toxoplasma (Leeds, Swansea, Tooting), leptospires (Leptospira Reference Unit), legionellas, listerias and neisserias (Division of Microbiological Research and Quality Control, Colindale), *Bordetella pertussis* (Pathogenic Microbes Research Laboratory, CAMR), *Campylobacter jejuni* and *Candida albicans* (Manchester), toxins of *Clostridium perfringens, Staphylococcus aureus* and *Clostridium botulinum* (Vaccine Research and Production Laboratory, CAMR), follicle stimulating hormone (Therapeutic Products Laboratory, CAMR) and immunoglobin E (Carlisle).

Gene probes Through the use of a technique derived from advances in recombinant DNA technology and molecular genetics, fragments of genetic material can be constructed and used to probe for the presence of similar genetic information in a variety of biological materials. While this type of procedure is a regular part of the work of the Molecular Genetics and Microbial Technology laboratories at CAMR, it is begining to be taken up in other parts of the Service. At Dulwich and in the Virus Reference Laboratory, Colindale, it is being used to probe specimens for the presence of parvovirus antigen; in the Division of Enteric Pathogens, Colindale, to detect genes specifying resistance to gentamicin and trimethoprim in intestinal bacteria; in Manchester to look for evidence of herpes simplex (with some success) and papovaviruses in the brains of epileptics; and in the Virus Reference Laboratory, Colindale, to identify viral DNA in malignant lesions of the skin.

FOOD AND ENVIRONMENTAL MICROBIOLOGY

Goats' milk As the Milk and Dairies Regulations apply only to cows' milk and with the increasing popularity of goats' milk as an article of diet, it was considered advisable to ascertain its bacteriological quality as sold to the public. A countrywide survey was organized in which 41 laboratories examined 2493 samples collected locally, mostly from small producers. The results, which were collated by the Food Hygiene Laboratory, Colindale, showed that the quality of most samples was satisfactory as judged by their low bacterial content.

Guidelines for the microbiological assessment of foods For a long time the methods used in the microbiological examination of foods have varied from one PHLS laboratory to another, as have both the criteria on which the quality of the food is assessed and the terms in which the results are reported. Several microbiologists in the Service with particular knowledge and experience have made a studied comparison of the various methods used and have compiled a draft manual of the methods they agreed were the most suitable. After a period for its assessment in routine use, it is expected that it will be published as a manual of PHLS preferred methods.

Microbes in the mining industry At the request of the National Coal Board, the Environmental Microbiology and Safety Reference Laboratory, CAMR, examined the oil-in-water emulsions used in hydraulic roof supports for their ability to support the growth of bacteria. Mineworkers are sometimes exposed to mists of these hydraulic fluids sprayed out from the supports. The laboratory showed that many potentially pathogenic species failed to survive in the emulsions, although two species of bacteria were capable of multiplying in one type of oil but not in another.

Free-living amoebae In the course of investigations of the Roman thermal springs in Bath following a fatal case of meningitis, the PHLS laboratory there recovered many strains of amoebae of the genus *Naegleria* from different parts of the complex, but was faced with the difficulty of distiguishing between the species capable of causing disease, *N. fowleri*, and the closely similar but harmless *N. lovaniensis*. Study of the enzymes produced by the two species has shown them to be different in several respects. This has allowed tests to be developed which make use of techniques widely used in clinical chemistry departments, so allowing the two species to be distinguished without resort to animal inoculation.

DISEASES OF CHILDREN

Cystic fibrosis The cystic spaces which develop in the lungs of children affected by this chronic disease are prone to constant reinfection by a variety

of bacteria, one of the most troublesome of which is *Pseudomonas aeruginosa*. With the help of grants from the Cystic Fibrosis Trust, research is being conducted on this organism at the Division of Hospital Infection, CPHL, and the PHLS laboratory at Oxford. At Colindale studies are being made of changes in the bacterial cell wall and of the role of antigenic variation on the course of the disease. A collaborative investigation with the Swiss Serum Institute has identified a part of the chemical structure of this organism which correlates with its virulence. At Oxford, the penetration of antibiotics through the "mucoid" surrounding these bacteria is being studied. At the Vaccine Research and Production Laboratory, CAMR, the effect of growth conditions on the production of certain components of the bacterium has been the subject of investigation. These are thought to be protective when incorporated in a vaccine and a protocol has been devised for its production.

Reye's syndrome in the British Isles This severe and often fatal diesase, which may occur at any age in childhood, principally affects the liver but also involves kidneys, heart and skeletal muscle, and was first reported in the USA in epidemic form in the 1960s.Originally it appeared to be a late sequel of infection by influenza B virus but subsequently has been associated with other viral infections. As there is, as yet, no laboratory test diagnostic of the disease, its recognition rests on clinical observation and biochemical changes. An attempt is being made to establish the nature and extent of its occurrence in the British Isles by clinical and epidemiological observation. A joint clinico-epidemiological surveillance scheme between the British Paediatric Association and the PHLS Communicable Disease Surveillance Centre was begun in August 1981 and the results obtained during the first year have been analysed. Twenty-seven definite and possible cases were recognized, of which 16 were fatal. This mortality is twice that experienced in the USA. The incidence at 0.21 per 100 000 population under 15 years was lower than that in the United States and the overall average age, 3 years and 10 months, was younger. There was no predilection for rural areas as in the USA, nor was there a winter peak in incidence. One-third of the cases in the survey were reported from Ireland. A preceding virus infection was identified in nine of 25 patients, but in only one case was it influenza B. It is planned to continue the study to assess the effect of other suspected risk factors.

THREE "NEW" MICROBES

Gastric campylobacter-like organisms Microscopical examination of small portions of the lining of the stomach removed from patients undergoing gastroscopy – a procedure in which the interior of the stomach is inspected by a flexible optical instrument – has previously shown the presence of unidentified curved bacilli but until recently they had never been cultivated (see Figure 6). Familiarity with the cultural conditions necessary for the

Figure 6 (a) Campylobacter-like organisms islolated from the lining of the human stomach (×14 000) and (b) the flagellae of these organisms (×34 800) showing their paddle-like tips.

growth of campylobacters – themselves curved bacilli which escaped recognition as important human pathogens for decades – has enabled the Manchester laboratory to grow campylobacter-like organisms from such specimens from 31 of 50 patients attending a gastroscopy clinic. There was a strong correlation between the presence of these organisms, antibodies to them in the blood and microscopic evidence of gastritis. There was, however, no evidence of invasion of the tissues; rather the bacilli appear to be confined to the layer of mucin on the surface of the lining membrane and in its pits. The exact classification of these organisms and their significance in relation to diseases of the stomach remain subjects for further investigations. In view of the enthusiasm which microbiologists have shown in uncovering the role of campylobacters in gastroenteritis, clarification should not be long awaited. Elsewhere in the PHLS, the Epsom laboratory has found similar organisms in two of 10 patients so far.

Cryptosporidium With the growing awareness of the potential importance of this hitherto unfamiliar parasite as another cause of gastroenteritis in normal patients, mainly under 10 years old, work is under way in several laboratories on various aspects of its diagnosis, control and prevention. Modified staining techniques which facilitate its recognition under the microscope have been published by the Rhyl and Brighton laboratories. The number of cases studied by individual laboratories thus far is too small to come to firm conclusions concerning the source of infection and frequency with which human-to-human transmission occurs. The subject is ripe for a collaborative investigation of the kind which the central organization of the PHLS makes easily realizable and which has yielded much valuable information on previous occasions. It is likely that a working party drawing on several laboratories will be established to elucidate the nature and extent of the disease caused by this parasite and to study means whereby the infection may be controlled and prevented. In such a working party there would be obvious advantages if one or more veterinarians were included, for veterinary pathologists have a longer and more detailed experience of this organism and cattle may prove to be one of the sources of infection.

Hantaan-like virus Outbreaks of a haemorrhagic fever accompanied by failure of the kidneys which occurred in Korea were eventually shown to be due to a virus, designated Hantaan, transmitted from rodents. Subsequently cases of a similar, but usually milder, illness have been reported from Scandinavia and, more recently, from western Europe. Human infection by a Hantaan-like virus has been detected for the first time in the UK among laboratory personnel working with an infected strain of rats. Preliminary antibody studies in the Special Pathogens Laboratory, CAMR, suggest that the virus is present in this country.

MOLECULAR GENETICS

Cytomegalovirus (CMV) Studies in the Molecular Genetics Laboratory, CAMR, are aimed at understanding the molecular biology of this member of the herpesvirus group. Although most of the infections it causes are symptomless, one of the consequences of a small proportion of CMV infections during early pregnancy is mental retardation in the child. CMV infections also complicate organ transplants and may endanger the lives of immunosupressed patients. The nucleotide sequence (code) of the major gene of this virus has been determined and "expression" of the gene obtained in bacterial and other cell systems. Eight other genes have been mapped and the glycoproteins enveloping the virus particle have been purified and partially characterized. The objective of this work is the production of diagnostic antigens and potential "subunit" vaccines from this virus by growth in the bacterium *Escherichia coli*. Other studies with CMV are directed toward investigating links between Kaposi's sarcoma (a malignant tumour associated with AIDS but which occurs natually also), CMV infections and the development of AIDS. Thus far the presence of genetic material from the virus has been detected in cells from Kaposi's sarcoma but its significance is at present uncertain.

Lassa virus The recent advances in molecular genetics and recombinant DNA technology provide a means of investigating dangerous organisms at the molecular level without risk of infection. This approach is being exploited in research in the Special Pathogens Reference Laboratory, CAMR, on Lassa virus in which various "clones" made from its genetic material are being used to determine the code which specifies the structural protein of the virus. A part of this has been determined and is expected to lead to a means of expressing this protein by growth in bacteria. In this way non-infectious products may be obtained from the virus for possible diagnostic use or as vaccines. A somewhat similar approach is being used in the Vaccine Research and Production Laboratory, CAMR, to obtain production of the protective antigen of Central European tick-borne encephalitis virus.

FERMENTATION TECHNOLOGY

Scale up of fermentation processes The Microbial Technology Laboratory, CAMR, has brought several processes from bench scale to larger scale fermentation using genetically engineered *Escherichia coli* systems for the production of prochymosin (an enzyme used in the dairy industry), bovine and swine growth hormones and an enzyme (carboxypeptidase G2) for use in combating the side effects of the anti-cancer drug methotrexate. The laboratory also successfully scaled up the fermentation and purification of streptaviridin, a protein required for diagnostic systems and gene probes. Computer control of small scale fermentation procedure was brought into

operation by linking with a Hewlett Packard A900 computer. Early research and development of an acoustic resonance densitometer indicated its potential for instant measurement of viable organisms during the fermentation process.

Enzyme research Following the successful development and application of a paracetamol-degrading enzyme to the assay of this drug, the Microbial Technology Laboratory brought an enzyme assay system for the measurement of salicylate to an advanced stage. This development will be of obvious value in the management of aspirin overdosage. Fibrinolytic enzymes of potential value in the prevention and treatment of thrombotic disorders have been further purified and their chemical and physical properties determined. A new and similar assay method for these proteins (tissue plasminogen activators) has been developed which can measure low levels of their activity. This should greatly assist in the next stage of development, the production of pure enzyme in large quantity. Another pair of enzymes of potential value in laboratory work are those responsible for the bioluminescence of a bacterium (*Photobacterium fischen*). A method has been devised which permits the separation and purification of the two enzymes concerned, at least to the degree necessary for the enzymes to be used as reagents in clinical biochemistry.

The Venereal Diseases Reference Laboratory

In about 1944, the Ministry of Health's reference laboratory for venereal disease serology became the Venereal Diseases Reference Laboratory (VDRL) of the Emergency Public Health Laboratory Service. Initially sited in the London School of Hygiene and Tropical Medicine, it moved to St Peter's Hospital (London E1), then to the Eastern Hospital, Homerton, and finally to the new research block at The London Hospital in 1955. The laboratory was concerned primarily with the provision of support for clinical laboratories, providing a second opinion on difficult sera in the diagnosis of syphilis, and in the early days, with the provision of antigens used by others in this testing. When it moved to The London Hospital, it became involved in providing a first-line diagnostic service for the large venereal disease clinic in Whitechapel.

For many years, the VDRL remained the final point of reference and adjudication for venereologists and laboratory workers in cases where difficulty had arisen in the diagnosis of syphilis, and with the identification and characterization of the gonococcus. However, as the years passed and more and more pathogenic microbes were incriminated as causes of sexually transmitted diseases, it became increasingly unrealistic for a single laboratory to try to cover the whole subject at the required level. In addition, the serological tests for syphilis had become simpler and more reproducible, so that the number of "difficult" sera diminished. As a result,

the PHLS Board began to examine other, and in the present financial climate, cheaper ways of providing the services available at the time from the VDRL. Eventually it was decided to devolve reference work on syphilis serology to seven laboratories, each of which had previously had substantial experience in the field. These seven were formed into a consortium, capable of providing a national reference service. The gonococcus reference work was transferred simultaneously to a new Gonococcus Reference Unit established at the PHLS laboratory in Bristol. These transfers were effected during the summer of 1983, and the VDRL in Whitechapel closed its doors as a PHLS unit on 30 September 1983.

Administrative and Financial Aspects of the Service

FINANCE

The DHSS and Welsh Office net cash allocation to the Board for 1983/4 was £26.2 million (as compared with £24.7 million for 1982/3), excluding finance for special capital schemes. This was augmented by £7.0 million (£5.8 million) of the Board's income, permitting a total gross expenditure funding of £33.2 million (£30.5 million).

The year was characterized by the announcement of successive reductions to cash limits. First there were the Chancellor's July measures which reduced the cash allocation by over 1 per cent in 1983/4. In November a further once only cut of 2 per cent was announced for the coming year 1984/5 together with a statement that this would be associated with cumulative reductions of 1 per cent for each of the three financial years 1984/5 to 1986/7.

The Board therefore set up an Expenditure Review Group (ERG) in the summer of 1983 which was given an expenditure reduction target for 1984/5 of £1 million, later increased to £2 million. The ERG was charged with the study of the central and peripheral activities of the PHLS in terms of functions and the determination of those functions which could be reduced or dispensed with.

Savings planned by ERG during the course of the year are summarized below; the implementation of some of them can only be achieved in future financial years:

(a) Restrictions on the filling of staff vacancies
(b) Deletion of certain posts throughout the Service
(c) Encouraging staff over 50 to opt for voluntary premature retirement
(d) Comparison of the productivity levels of each of the peripheral laboratories and the encouragement of directors of laboratories with low productivity to make staff savings
(e) On the recommendation of a Scientific Review Committee, following a visit in September 1983, closing the PHLS

Mycoplasma Reference Laboratory and transferring its residual functions to the new Central Public Health Laboratory at Colindale.

(f) Merger of the Communicable Disease Surveillance Centre (CDSC) with the Epidemiological Research Laboratory to form a new Division of Epidemiology at Colindale

(g) The setting up of "value for money" reviews to examine the cost of scientific activities of laboratories at CPHL and CAMR in relation to their benefit to the Board's objectives

(h) Reductions in overhead costs at CAMR

(i) Transfer of the diagnostic work of the Special Pathogens Reference Laboratory from CAMR to CPHL at Colindale.

(j) Transfer of reference facilities from the Environmental Microbiology and Safety Reference Laboratory at CAMR to Colindale.

During the latter part of the period under review, major changes were made to the Board's accounting system as a result of changes in VAT legislation. Computer Services staff were assisted by Cooper and Lybrand Associates in order to meet the legislative deadline.

INCOME GENERATION AND GRANTS FROM OTHER ORGANIZATIONS

Income received by the Board amounted to £7.0 million in 1983/4, an increase of 21 per cent on the previous year. The main reason for the increase was a grant from the Department of Trade and Industry (DTI) to fund a Fermentation Technology Development Project at CAMR and the building of a National Collection of Animal Cell Cultures (NCACC). These two projects got under way during the year and the NCACC was formally opened in the summer of 1984.

Several agreements were signed during the year with potential for future income from royalties. An example was the agreement with LH Fermentation to supply processed virus suspensions for use in a herpes vaccine under development at the University of Birmingham.

The Standing Committee for Income Generating Activities (SCIGA) met on several occasions under the chairmanship of Professor Richmond. Early in the year SCIGA considered a proposal from Technical Development Capital (TDC) Ltd (a division of Finance and Industry) to achieve greater exploitation of CAMR products and services. Although the TDC proposals were not accepted by the Board, it was agreed to produce a business plan for CAMR and this task was completed in the spring of 1984.

Meanwhile discussions began during the course of the year with several companies concerning their possible interest in collaborating with CAMR to assist with its commercial development. The Department of Health and Social Security is closely involved and any final decision will rest with Ministers.

GRANTS

The Annual Accounts on page 82 show the sums received by the Board in the form of grants. The main bodies from which grants were received and the amounts given are shown in Table 5. In 1982/3 the total of grants received amounted to £968 017.

Table 5 Grants received by the PHLS during 1983/4

Grant-giving body	
World Health Organization	40 348
Medical Research Council	137 837
Cancer Research Campaign	212 342
Department of Trade and Industry	1 715 369
Other bodies	397 956
Total	2 503 852

CAPITAL PROJECTS

Major capital schemes The Chairman and members of the Board held a formal meeting with the design team in January to discuss progress on the New Colindale Project. Concern had been expressed by the Project Manager about reductions in the workforce and reduced levels of productivity on the site. The contractor, also, had asked for a phased handover of the building, but for various reasons this was not accepted by the Board. The design team was, however, optimistic that the new laboratories would be completed by Christmas 1984. Figure 7 shows progress on the building near the end of the financial year 1983/4.

Work on the Production Centre at CAMR started on 13 June 1983 with a completion date in November 1984. Because of unforeseen difficulties, the project is some 8–9 weeks delayed but costs are under control. Following a technical review of the fermentation pilot plant project by the Department, the Board was given permission to proceed to budget cost stage. The submission was made towards the end of the period under review and Treasury approval is awaited. In connection with the construction of the two major projects, work on the primary services commenced on site at CAMR. At the suggestion of Martin Barnes and Partners, the Board's project managers, a separate firm of quantity surveyors was appointed to assist with the fermentation pilot plant project.

The building of the National Collection of Animal Cell Cultures (NCACC) at CAMR cost £250 000. The project was financed by the Department of Trade and Industry.

Figure 7 A view of the new Central Public Health Laboratory at Colindale, showing progress near the end of the financial year.

Regular capital building projects and laboratory development Mention was made in last year's Annual Report that work commenced on the joint laboratory at the new William Harvey Hospital, Ashford, Kent in April 1982. The building was completed early in 1984, and most of the staff and activities of the Maidstone Laboratory, which was closed in January 1984, transferred to it. It will be formally opened later in that year. The cost to the Board will be approximately £700 000.

The Chairman opened a new building for the PHLS laboratory at Gloucester in April 1983 (see Figure 8). The cost to the Board was £420 000.

Modifications to the Plymouth laboratory were completed during the year at a total cost of £75 000. The PHLS Gonococcal Reference Unit at the PHLS laboratory in Bristol was constructed early in 1984 (for £100 000). In addition the new joint laboratory at Tooting was completed (£250 000), as was the extension to the laboratory at Poole (£35 000).

At CAMR work was completed on an experimental unit for the investigation of problems in laboratory sterilizers (see Figure 9). The Board approved a proposal to form a new laboratory called the Experimental

Figure 8 (a) The exterior of the new PHLS laboratory at Gloucester and (b) the interior of one of the laboratory areas.

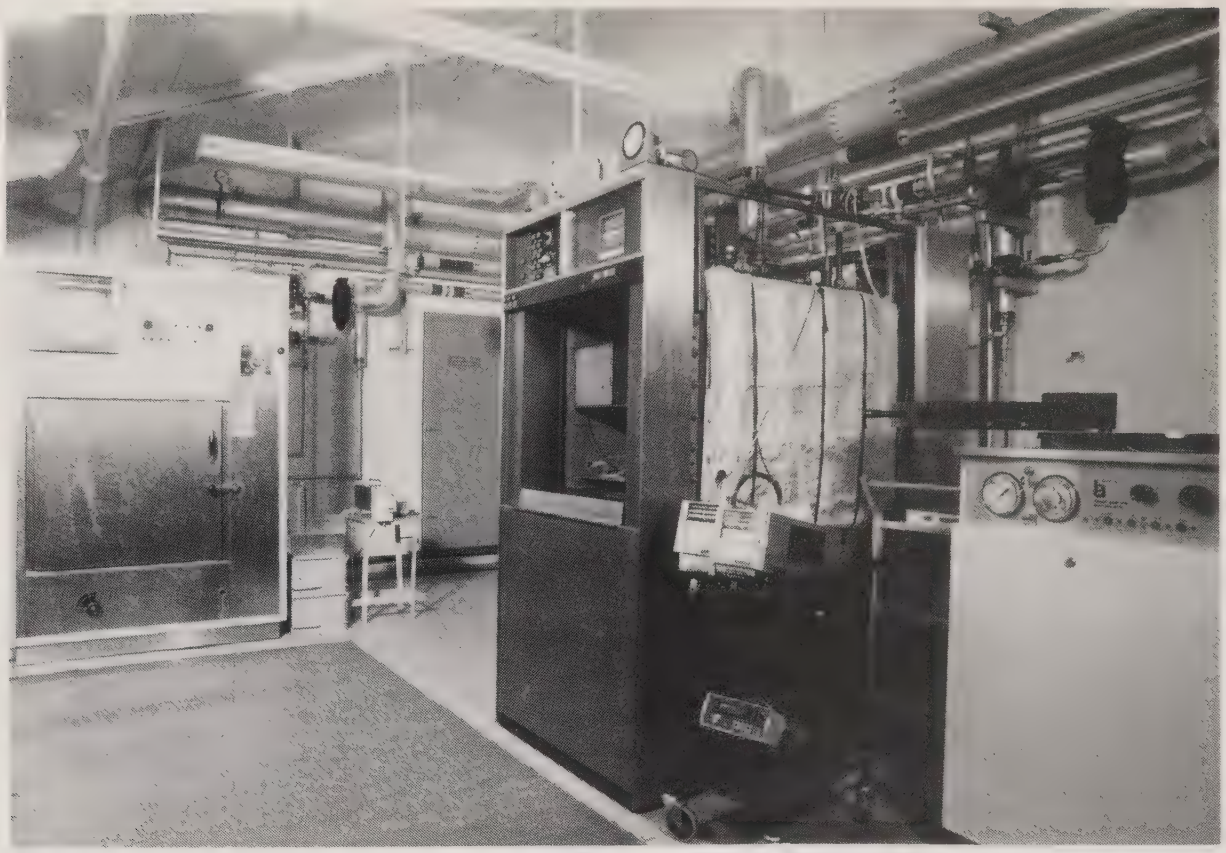

Figure 9 Part of the new experimental unit for the investigation of laboratory sterilizers at CAMR.

Pathology Laboratory at CAMR. The new laboratory would take over some of the responsibilities of the Pathogenic Microbes Research Laboratory at no additional cost to the Service.

REVIEWS OF THE SERVICE

It was reported last year that negotiations were in hand between the DHSS and Whitley staff side representatives about a major review of the PHLS. The review was undertaken at the request of the Management and Personnel Office of the Treasury by a team from the DHSS Staff Inspectorate who were assisted by two professional advisers: Professor Ian Phillips of St Thomas's Hospital Medical School and Dr Robert Blowers, formerly consultant medical microbiologist at Northwick Park Hospital. Its terms of reference were to review the effective, efficient and economical operation of the Public Health Laboratory Service, including its functions, and its most appropriate organization and staffing in terms of numbers, grades and manpower costs.

The review began at CAMR early in April 1983 and was thereafter carried out at CPHL, CDSC and the central services at Headquarters together with a sample of some 15 out of the 52 regional and area laboratories. The method of the review was the completion of questionnaires by all staff at the laboratories visited followed by interviews with the review team. The team

also visited the microbiological departments at nine NHS hospitals.

Meanwhile the Board began its own review of the Service by establishing Strategic Review Working Parties to report on four aspects of policy. The working parties, with their chairmen in parentheses, were as follows: epidemiology (Dr A. D. Bostock), new technology (Professor M. H. Richmond), research policy (Professor Rosalinde Hurley), regional and area laboratories (Dr E. L. Harris).

The working party on epidemiology proposed the creation of a Division of Epidemiology under a single director by merging the Epidemiological Research Laboratory with the PHLS Communicable Disease Surveillance Centre. As reported elsewhere, this was accepted by the Board. The working party on new technology proposed the setting up of a Standing Advisory Committee on Monoclonal Antibodies to oversee the development and application of these important new reagents and this was also agreed by the Board.

It soon became apparent during the course of these strategic review discussions that an evaluation of developments in computer technology should be undertaken. Accordingly a working party was set up to advise on all matters of policy relating to the use of electronic data processing equipment in the PHLS. The outcome of this review is reported below.

The working party on research recommended the setting up of a centrally administered panel to allocate research grants to laboratory directors and this was approved in principle by the Board. However, it was recognized that the Board did not have sufficient funds to implement the proposals immediately.

Finally, the report of the working party on the regional and area laboratories was overtaken by the cuts in the Board's funding announced during the course of the year. The immediate outcome of this was that the Board established the Expenditure Review Group (ERG), referred to earlier, to examine the objectives and the resources allocated to all the laboratories, both central and peripheral, throughout the Service. A summary of actions so far taken by the ERG has been given above.

COMPUTER SERVICES

A major review of policy was undertaken by a Computer Services Working Party under the chairmanship of Dr A. D. Bostock. This was an outcome of the strategic review carried out by the Board and mentioned above. The working party made a number of recommendations which are now in the course of implementation. First it recommended that the Computer Services Department be retained to provide specific services to the PHLS and that this would continue to be a Headquarters responsibility. Secondly, a Steering Committee for Computer Services was to be established, chaired by a Deputy Director of the Service and consisting of representatives of the main users throughout the Service, with appropriate co-opted members. Third, the existing computer user groups should continue.

Finally the working party considered the management approaches required for different types of computer systems, and concluded that the responsibility for computers which were integrated into laboratory equipment, or those used for small, simple data processing needs could be devolved to laboratory directors. The Board agreed that the expertise of the Computer Services Department would be drawn on for all other requirements.

At the end of March 1984 the steering committee which had been overseeing the development of the Microlab system held its final meeting. A smaller Microlab Assessment Group was formed which will report during the next year. The CTL Modular 1 computer at CAMR was replaced by a CTL 9000 series mini-computer which will allow further developments to take place.

LIBRARY SERVICES

The Chief Librarian, with the advice and support of the Library Policy Subcommittee, completed the review begun in 1982/3 of procedures and services; as a result new systems have been introduced. The library services are essential to the work of PHLS and are available to all its laboratories. Rationalization between the libraries at CPHL and CAMR continued with the object of maximizing the resources available on the two sites. A VDU terminal with automatic dialling and "log on" facilities was installed in the library at CAMR so that computerized literature searches could be done there. A similar installation will be made at Colindale to upgrade the searching facility at CPHL. The acquisition of a photocopier for the main library reduced the loans made from stock by 14 per cent and the journal circulation by 10 per cent, so it is now possible to supply copies of specific articles in response to requests rather than the journals themselves. There was an increase of 34 per cent in the number of items borrowed from libraries outside the PHLS.

PUBLISHING AND THE PHLS

In 1983 the PHLS decided to sever its connection with HMSO and, in the future, to take on full responsibility for all aspects of its own publishing activities.

A number of results of this decision are worthy of mention. In April 1983 the Service instituted a cash with order sales mechanism for its publications through the PHLS Supplies Department. In October 1983 a new publication, *PHLS Microbiology Digest*, was introduced as a quarterly short review journal, replacing its immediate precursor *What's New*. Thirdly, in January 1984, the *PHLS Library Bulletin* was made available as a commercial publication.

The Publications Section was able to show a small profit on its activities during 1983/4. It is intended that this profitability be maintained as publishing activities are gradually increased during future years.

STAFF MATTERS

The Board continued its policy of restricting the filling of vacancies throughout the Service and encouraging voluntary premature retirement. Twenty staff availed themselves of the terms in the year under review. As shown in Table 6, these policies resulted in a 2 per cent reduction in staff numbers through natural wastage.

A policy on employment was approved by the Board and circulated to the recognized Whitley trade unions and staff associations. The policy applies to all staff and is designed to cater for compulsory redundancy where this should prove unavoidable. The Board also accepted redefined criteria for regrading certain categories of stafff and set up the necessary administrative

Table 6 Number and grades of staff employed by the PHLS as at 31st March 1984 (in whole-time equivalents)[a]

	Staff numbers as at 31st March 1984						Total as at 31st March 1983
	Regional and area laboratories[b]	CPHL	CAMR	CDSC	HQ[c]	Total	
Consultants	86	11	1	4	3	105	112
Other medical	39	6	1	2	–	48	51
Top Grade and Principal Microbiologists	21	24	57	–	1	103	60
Other Microbiologists	33	38	35	1	–	107	150
Technical Officers and Principal and Senior Chief MLSOs	51	10	2	–	1	64	63
Other MLSOs	734	60	68	1	–	863	875
Works staff	–	1	6	–	–	7	7
Administrative and clerical staff	207	64	33	22	68	394	403
Ancillary staff and others	204	86	99	–	6	395	407
Totals	1375	300	302	30	79	2086	2128

[a] The figures exclude 73 staff on short-term contracts employed on specially funded projects.

[b] In addition there were over 752 staff working in joint PHLS/NHS laboratories who were employed by health authorities.

[c] Includes Supplies Department and Computer Services.

machinery for considering regrading proposals. However, a temporary freeze on non-mandatory regradings had to be imposed at the beginning of 1984 because of the difficult financial situation.

International Aspects of the Work of the Service

During the year 1983/4 the PHLS continued its involvement with other national and international public health organizations. The three topics dealt with below are merely illustrative of the forms which such collaboration takes; they are by no means intended to cover fully the wide range of interactions which take place on a regular basis.

THE SECOND INTERNATIONAL WORKSHOP ON CAMPYLOBACTER INFECTIONS

This international workshop was held in Belgium under the auspices of the PHLS, The Free University of Brussels and the International Centre for Diarrhoeal Disease Research. Campylobacters are comparatively recently recognized micro-organisms implicated in a range of illnesses in man and animals. The past 15 years has seen a significant increase in our knowledge about this organism and the Second International Workshop provided a forum for some 200 specialists to meet and discuss current knowledge and future directions.

Over the three days of the meeting some 160 oral and poster presentations were given which dealt with (a) clinical and therapeutic aspects; (b) taxonomy, biotyping, isolation and detection; (c) antigens and serodiagnosis; (d) serotyping and phage typing; (e) pathogenesis; (f) epidemiology.

A number of interesting developments were discussed, notably the islolation of campylobacter-like organisms. There was also extensive review of the relative merits of the serotyping schemes of Lior and Penner. The large number of papers dealing with epidemiological matters clearly indicated that raw milk, water and poorly cooked food (especially poultry) are sources and vehicles of infection, and that campylobacters are a common cause of travellers' diarrhoea.

Most of the public health measures appropriate to the control of campylobacter infection apply equally to the control of other microbial infections which are derived from environmental and food sources. These include the provision of safe water and milk supplies; good hygienic practices in animal husbandry and in the handling of raw foods; adequate cooking; kitchen hygiene; and public awareness of the hazards.

PHLS staff contributed significantly to the scientific content of the workshop and the proceedings were subsequently published by the PHLS Publications Section in November 1983 (*Campylobacter II*, PHLS, London, 1983).

TRAINING IN EPIDEMIOLOGY

As a part of a three-year senior registrar's training at the PHLS Communicable Diseases Surveillance Centre, Dr Susan Hall spent some six weeks in December 1983 and January 1984 visiting hospitals, public health laboratories and other organizations in India – notably in Pune, Bombay and Delhi. India is an especially appropriate country for a British trainee epidemiologist to visit in view of the density of international travel between it and the UK. Changing patterns in the incidence of communicable disease in the one may be mirrored in the other.

The prevalence of communicable diseases in the Third World can come as a shock to the postgraduate medical trainee. Public awareness of personal and food hygiene practices is widely promoted in India, but the sheer size of the problem is difficult to grasp without direct experience. When it is realized that, regrettably, the majority of cases of serious infectious disease still go unreported in India, it is a salutary lesson to learn that there were over 23 000 *reported* cases of rabies in 1979.

Dr Hall's training visit included specifically a state public health laboratory in Pune which has close links with the PHLS. It is interesting that the present aims of that laboratory conform in many ways with those of the PHLS itself. As is the case in many of the Third World countries, however, financial restraints make it difficult for public health to be promoted and safeguarded with as much success as many Indian specialists might wish.

A wide range of social, cultural and other reasons contribute to the public health picture in India, and it is wise to remember the short time it has been since diseases such as cholera, diphtheria and tuberculosis were endemic in Europe while wishing out Indian colleagues well in their own struggle to improve public health and thanking them for their contribution to the education of one of our own members of staff.

AN ADVISORY VISIT TO PAPUA NEW GUINEA

Papua New Guinea is approximately twice the size of the United Kingdom but with only about 5 per cent of the population. Separated from Australia by the Torres Strait, it is a country of many geographical, cultural and linguistic contrasts and since gaining its independence in 1975 its citizens have taken increasing responsibility in all walks of life at regional and national level. This is very evident in the health service, which has elements of the Australian and our own NHS systems. The Secretary of Health of Papua New Guinea had requested the regional office of the World Health Organization (WHO), in Manila, to undertake a review of the bacteriology services with special reference to the following: (a) the bacteriology services at Port Moresby General Hospital and other hospitals in Papua New Guinea; (b) the role of the bacteriology laboratory at Port Moresby as a reference laboratory; (c) the bacteriology services in the regional hospitals

and the needs of district hospitals; (d) the work of the Public Health Laboratory.

Dr Colin Roberts of Liverpool Public Health Laboratory agreed to undertake the assignment during November and December 1983 and received a detailed briefing in Manila before the onward flight to Port Moresby. His base was in the bacteriology laboratory at Port Moresby General Hospital, with frequent visits to the health offices, the local office of WHO, the hospital clinical departments, the adjacent Public Health Laboratory, the medical school, the College of Allied Health Sciences and the office of the Red Cross. Visits to other parts of the country included hospitals at Lae and Garoka, where the Institute for Medical Research is based, and the National Veterinary Laboratory at Boroko. Statistics available from WHO sources provided useful guidelines to the nature of some of the problems, e.g. the maternal mortality rate and infant mortality rate in 1976 were two and 90 per 1000 population, respectively. The 10 leading causes of morbidity were all microbiological in aetiology and included influenza, measles, gonorrhoea, syphilis, pertussis, pigbel, tetanus, poliomyelitis and diphtheria. Microbiological causes were also a major influence on mortality (especially pneumonia), the epidemiological figures and the immunization programme.

Overall the problems were mainly organizational, i.e. training sufficient technical staff and eventually encouraging medical students to consider pathology as a career. The microbiology service in the capital hospital was capable and ready for expansion – including reference work – and the Public Health Laboratory was ideally placed to collate the epidemiological results of environmental and community health microbiological investigations. The bacteriology services in the other hospitals required improvements which would inevitably follow the proposed changes at Port Moresby General Hospital. The generous help of everyone whom Dr Roberts met ensured that the assignment objections were readily achieved and recommendations to this end were conveyed to the Secretary of Health before the written report was completed at a return visit to Manila for debriefing.

Special Topics

BIOSENSORS

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Biosensors are devices or systems capable of specific, self-contained biological or biochemical measurements. Their importance lies in their ability to extend, simplify and lower the cost of laboratory-based analytical work and to provide the basis for remote biological monitoring systems. Although biotechnology and the environment are major areas of application, clinical medicine is seen as the most significant.

Some areas of clinical medicine are heavily reliant on automated systems for the rapid analysis of patient's body fluids. Knowledge of the levels of key body metabolites, drugs and other therapeutic agents is an indispensable part of clinical diagnosis and treatment. Biosensor technology is already beginning to replace some existing automated techniques (e.g. in glucose analysers) and will allow the development of hand-held diagnostic assay devices for use in hospital wards, in general practice and even by patients themselves, thereby benefiting diagnosis and treatment in diseases where knowledge of laboratory analyses is of immediate clinical importance. Implantable biosensing devices, combined with miniature pumps for drug delivery, are already foreseen (e.g. the artificial pancreas).

Analogous biosensor and feedback control combinations are now being evaluated in the optimization and management of the microbial processes used in the manufacture of drugs, therapeutic and diagnostic agents and may lead to the development of bedside monitors based on biosensing devices for use in intensive care and casualty units. If portable, low cost analysers can be developed they would have obvious value to the practice of medicine in the Third World.

Although it is 20 years since the first biosensor (the enzyme electrode) was described, only in the last few years has the large and scientifically wide research base necessary for the development of reliable biosensing devices been established in Japan, Europe and the USA. Reliability, usability and appropriate and high specificity are major concerns (and shortcomings) of biosensor development. Although methods of manufacture and operation

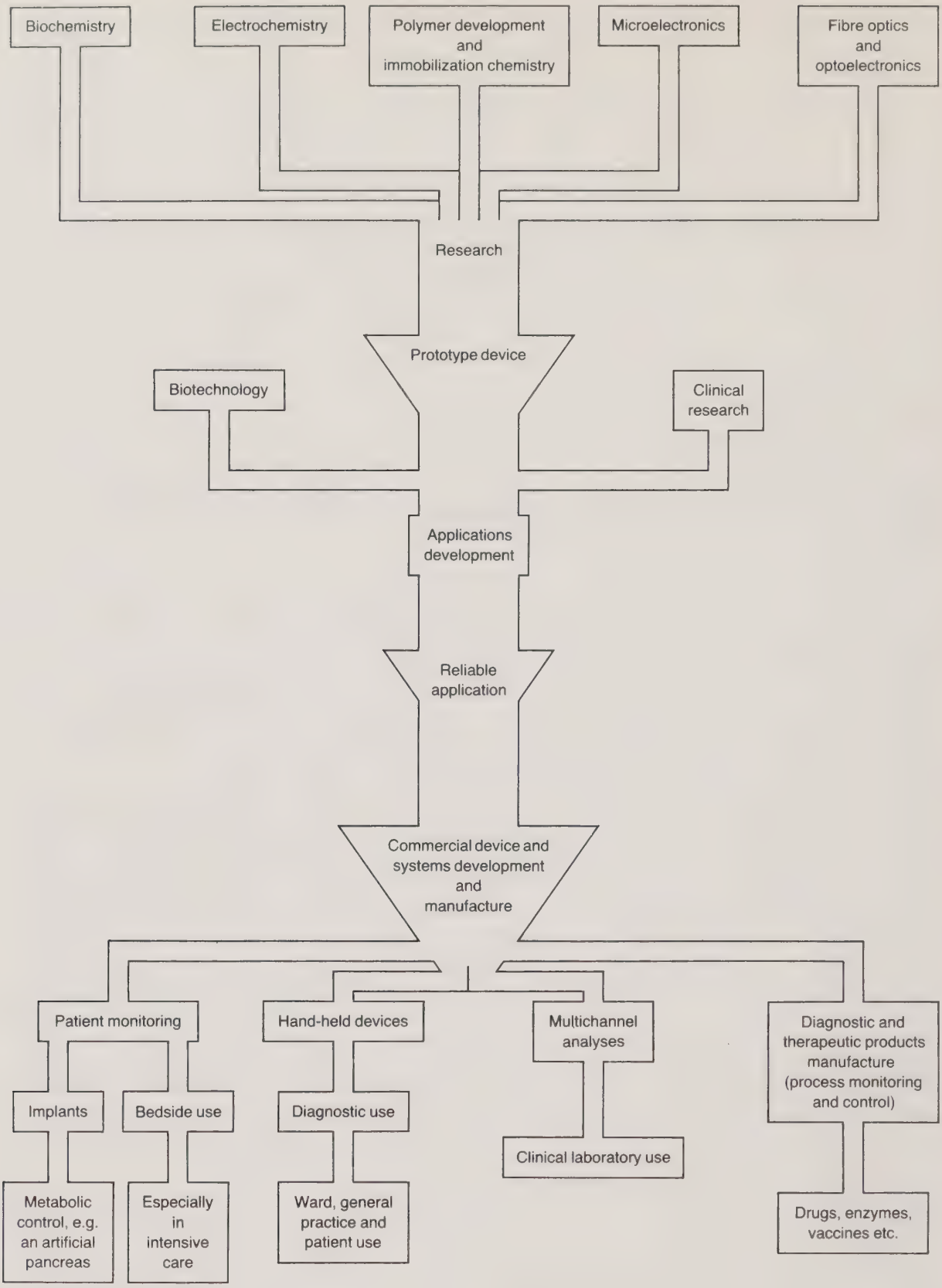

Figure 10 Stages in the development of biosensors, together with areas of application.

of biosensing devices are numerous and confusing, even to the initiated, both the devices and their development can be viewed remarkably simply.

All biosensor devices involve the use of one or more biological product, e.g. a small biochemical species, an enzyme or even whole cells applied to a suitable detector or "transducer". The number of biochemical species in any

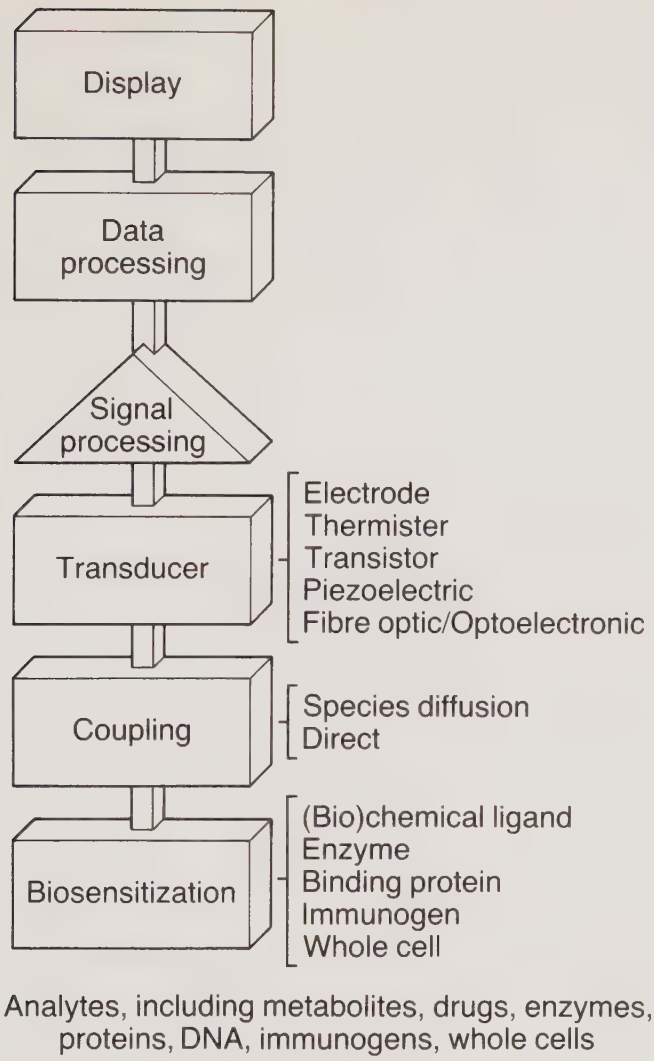

Figure 11 A schematic diagram to illustrate the way in which biosensors operate.

biological sample is vast, whereas the available range and specificity of transducers is comparatively small. Accordingly, a biosensitive layer of matter on the biosensor converts individual species specifically into locally modified products of that species with a resultant change detected by the transducer. Electrodes are used to capture biochemically generated electrons and detect changes in ion activity (e.g. pH). Thermistors detect the heat generated by biochemical reactions. Piezoelectric crystals are highly sensitive to surface binding of biochemical species. Changes in optical properties are transduced by optoelectronic devices, often mounted at the top of a fibre-optic light guide. Many types of transistor are highly sensitive to changes in the electrical field at the interface between their "gate" and the sample which can result from the intrusion of most biochemical species into this interface. Biosensors capable of monitoring many types of biological reaction can be constructed by the application of one or more of these principles.

The inherent instability of the biological material used in the biosensitive layer as been reduced in three ways. The use of a stable population of whole cells allows the metabolism of the cell to maintain both the cell population and the level of required enzymes. The immobilization of labile species (e.g.

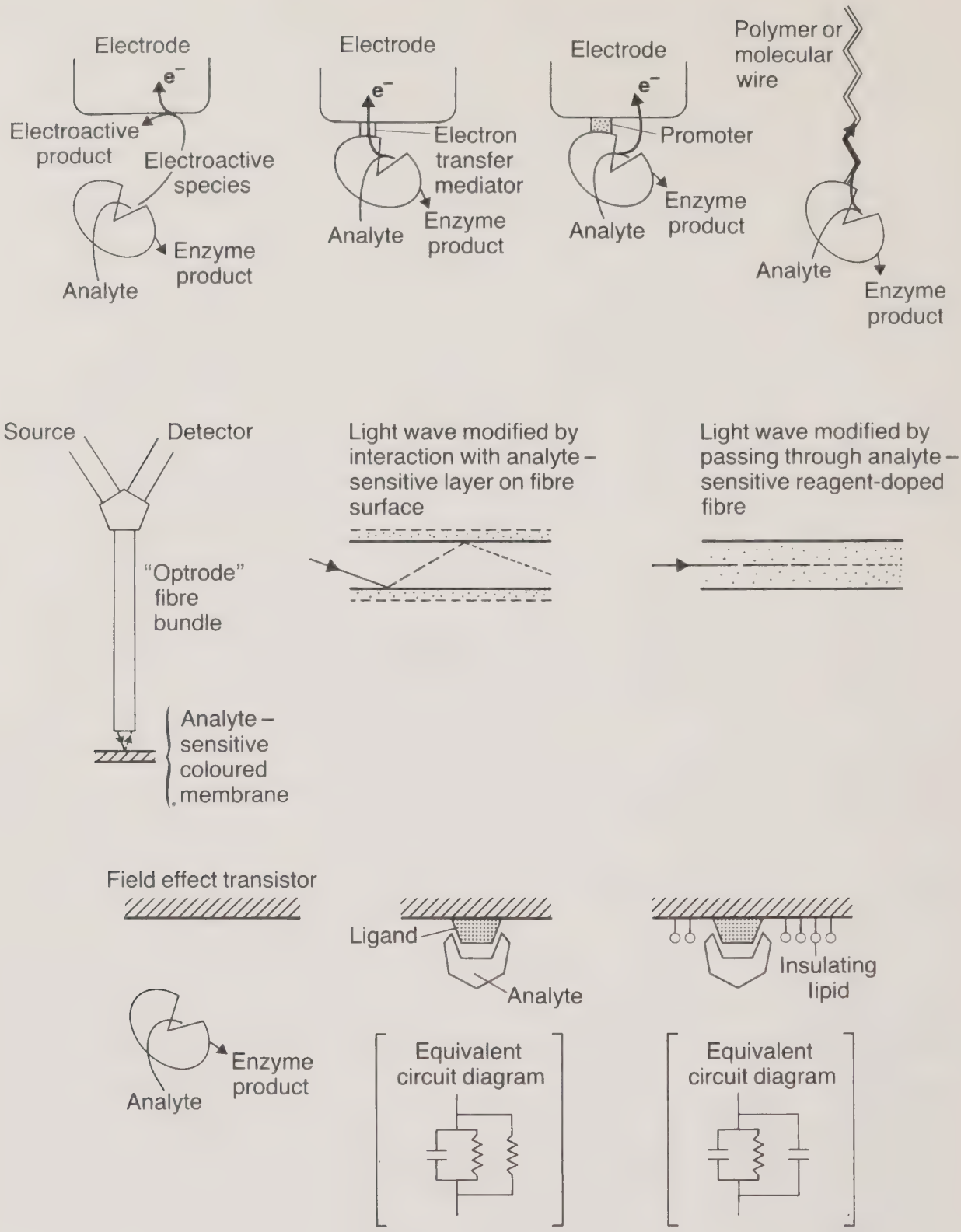

Figure 12 Details of the modes of action of different types of biosensor.

enzymes) on the detector surfaces, either by chemical cross-linking or by encapsulation within polymers, frequently improves their heat stability and resistance to attack by the deleterious agents present in many biological samples. Enzymes derived from organisms that normally grow at high temperatures (thermophiles) are usually found to be more chemically and thermally stable. Generally, the former instability of the biosensitive layer is no longer a significant problem. The remaining barriers to the provision of a

wide, reliable and appropriate range of biosensors lie in ways of providing closer coupling throughout the components of the biosensing system.

Most enzyme electrodes operate by the detection of electroactive species (e.g. hydrogen peroxide for glucose oxidase-sensitized electrodes), which generates current in the electrode system. Significant improvements in coupling (and the biosensor device) have been achieved first by the artificial transfer of electrons directly from the enzyme to the electrode using "mediators" and subsequently by encouraging intimate contact (and even more direct electron transfer) between the enzyme and electrode by the use of special binding agents or "promoters". Developments in molecular physics and polymer chemistry have allowed the construction of "molecular wires", whose connection to biological systems is eagerly awaited. The marriage between microelectronic technology and biochemistry has provided a range of extra fabrication problems, in particular those resulting from the small size of devices. It is only recently that solutions have begun to be found. Although field effect transistors (FETs), in the forms of ion-sensitive FETs (ISFETs) or biochemically-sensitized FETs (BIOCHEMFETs), can be seen to operate very much as their electrode counterparts, more direct exploitation of these field-sensitive devices is already being engineered. The basic problem is that of avoiding the dissipation of field gradients at the interface between the biosensor device and its biosensitive layer. Conventional immobilization chemistry maintains aqueous (conductive) paths around the immobilized chemical or biochemical and the approaching biochemical. Unless both are small (and therefore close to the interface), the field changes are not "felt" at the interface. Very much as bioelectrochemists have engineered electron transport systems reminiscent of biological cell membranes, insulating lipid-like layers (e.g. Langmuir films) are being engineered around the biosensitive elements to extend the range of field-sensing devices. A similar progression towards more direct coupling is occurring in optical biosensor development. The condensation of colorimetric and spectrophotometric assays into optically responsive films presented to a fibre-optic bundle ("optrode") is being replaced by the incorporation of the biosensitive material on the surface of, or even within, individual optical fibres. Significantly, the latter will respond to the special light propagation and/or wave effects now so extensively used in highly sensitive physical transducers.

All of the above mechanisms either do, or will, allow the mounting of the biosensitive layer and transducer surface on microelectric devices. With the advent of micro-optics, light-emitting diodes, laser diodes and photodiodes, the potential range of devices will be extended to include optical biosensors. This means that the remaining elements, analogue signal conditioning and digital data processing, can be envisaged as being part of a single, solid-state multisensor chip. Indeed, such devices have already been reported for the more established ISFETs.

For some time the Microbial Technology Laboratory has been developing new assays required in clinical practice, principally in collaboration with

Addenbrooke's Hospital at Cambridge. Although this activity was first based on the isolation and large-scale production of new microbial enzymes, work is now progressing towards the engineering of new proteins by molecular biological techniques (e.g. fusing amplifying enzymes to Protein A-based assays). Such activities have provided a sound basis for the establishment of a "biosensor" group within the PHLS. The breadth of activity required for success in this field, however, necessitates collaborative research and links have been forged with universities, research establishments and industrial organizations working in the chemical and physical fields.

RETURN OF THE STAPHYLOCOCCI

Professor E. Mary Cooke
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For some years one of the major problems in hospital infection control has been the emergence of bacteria resistant to many of the commonly used antibiotics. This, in the past, has occurred particularly with Gram-negative bacilli but more recently also with *Staphylococcus aureus*. This organism was associated with severe outbreaks of infection in hospitals in the 1950s and 1960s and the important strain at that time was phage type 80/81 which was resistant to the antibiotics available then. The outbreaks occurred predominantly in surgical and in maternity units and were often severe enough to necessitate the closure of wards. At that time much work was carried out on the problem; host factors were defined, mechanisms of spread elucidated, the role of nasal carriage and the extent of dispersion were investigated. Standard methods for the control of spread of staphylococcal sepsis were worked out and have been used ever since.

This epidemic, due to the "hospital staphylococcus", as it was named, came to an end with the introduction of methicillin, a new antibiotic to which this organism was sensitive; since then, until recently, staphylococci have generally not caused major problems in hospitals. However, during the last year or two the staphylococcus has re-emerged as a major hospital pathogen. The strains which are now of importance are resistant to methicillin and to most other antibiotics, so that therapy becomes difficult.

Methicillin resistant *Staphylococcus aureus* (MRSA) has become widespread in many countries and hospital-acquired infections have occurred. Well documented outbreaks have particularly been reported from Australia and Ireland, although occurring in many other places also.

In the UK, although MRSA outbreaks have occurred sporadically for many years, major outbreaks have been rare and we had begun to hope that perhaps, for some ill understood reason, this particular problem might pass us by. It was of course an ill founded hope which has not been fulfilled and we are now experiencing major outbreaks in some of our hospitals.

Figure 13 Map showing the distribution of MRSA in England and Wales. Hatched areas represent those regions with no hospitals with >1 per cent MRSA; stippled areas represent those regions with hospitals with >5 per cent MRSA.

A survey has recently been carried out from the Division of Hospital Infection, Central Public Health Laboratory, to determine the overall distribution of MRSA and the extent of the problems which outbreaks are causing. This was done by asking consultant medical microbiologists to complete a questionnaire about the hospitals they serve. The main fact which emerged from this survey was that MRSA are widespread, being

present in 70 per cent of hospitals. However, in most MRSA do not constitute a serious problem and only eight hospitals had had more than three cases of MRSA septicaemia in two years. Septicaemia is particularly seen in those hospitals where more than 10 per cent of the staphylococci islolated are methicillin resistant. The units most commonly affected are geriatric, orthopaedic, intensive care and surgical and the most common sources are skin (including ulcers and pressure sores) and wounds. Serious MRSA problems are at present geographically localized. This is shown in Figure 13, which illustrates those regions which have no hospitals with more than 1 per cent of staphylococcal strains methicillin resistant and those regions which contain some hospitals with more than 5 per cent MRSA. There is no reason to suppose, however, that MRSA problems will remain localized in this way and much investigation is needed. We have to re-examine the information obtained during the earlier staphylococcal outbreaks to determine whether the same applies to the organisms now causing problems. There is already some evidence that they may be behaving differently. Certainly our hospitals are very different places than they were in the 1950s and 1960s and there can be no doubt that in these modern hospitals MRSA can cause severe problems.

For some years workers in the field of hospital infection control have speculated about what the next important organism would be after the Gram-negative bacilli. We now know.

"FIFTH DISEASE" AND THE HUMAN PARVOVIRUS

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Last year, in a paragraph headed "A virus in search of a disease", the PHLS Annual Report described how an infectious disease with a rash, erythema infectiosum or "fifth disease", had been associated with a recently discovered virus, the human parvovirus. As members of the Service had been involved both with identifying the virus and making the association with fifth disease, a PHLS working party was set up to investigate the link more fully. This year much more information is available about fifth disease; the speed with which it has been gathered shows how effectively a co-ordinated microbiology service can investigate a "new" infectious disease, recognize its cause and detect its unusual as well as its common features.

Although fifth disease has been known for 80 years or more as a form of infectious rash distinct from such childhood illnesses as measles, scarlet fever and rubella, its association, in 1983, with the human parvovirus has raised new questions. These include the following: (a) Is fifth disease always due to the parvovirus or could different viruses be involved in other outbreaks of the disease? (b) Is fifth disease in fact the commonest clinical

Table 7 Some outbreaks of fifth disease investigated by members of the PHLS Working Party on Fifth Disease

Date of outbreak	Location	No. of cases of fifth disease tested	No. of patients with IgM antibody to human parvovirus [a]
1962	Virginia, USA	12	11
1978, 1981	Tokyo, Japan	27	26
1981	Fukuoka, Japan	34	33
1983	Enfield, UK	36	36
1983	Melbourne, Australia	49	18
1984	Malmo, Sweden	21	14
1984	Turku, Finland	10	7
1984	Grampian Region, UK	501	209
1984	Suffolk, UK	44	23

[a] Indicates recent infection.

manifestation of human parvovirus infection? (c) What might the complications of this usually mild childhood illness be?

In its first year the working party has addressed these questions. It has investigated several past and present outbreaks of fifth disease, all of which have proved to be due to the parvovirus (Table 7), and it has also been able to link many sporadic cases of fifth disease with the virus. Enough outbreaks and individual cases have now been ascribed to the human parvovirus for it to be unlikely that typical fifth disease with the characteristic "slapped" cheeks and lacy, recurrent rash can have any other cause.

By 1983 it was known from antibody studies that the human parvovirus was widely distributed and that it infected up to two-thirds of the population by the time they had reached adult life; but the virus remained almost an "orphan" in that, hitherto, it had only occasionally been associated with disease, usually an anaemic episode in patients with hereditary defects of the red cell such as sickle cell disease. It has been very satisfactory, therefore, to recognize that the virus causes a common disease of childhood. Like much viral illness in children parvovirus-related fifth disease is generally mild; this suggests that an unknown but possibly high proportion of infections do not result in any obvious illness. There can be little doubt, however, that fifth disease is the main manifestation of parvovirus infection in so far as it is clinically expressed.

The third question for the working party concerned the complications of human parvovirus infection, and has yet to be fully answered. It has been known for some time that adults with fifth disease may develop pain in their

joints and muscles, and that occasionally there may be a severe recurrent arthritis. Other sequelae have been noted, e.g. nephritis and a persistent symmetrical muscle weakness, but so far this has happened too infrequently for us to be sure of the connection. Two other possible complications of human parvovirus infection may be anticipated. The first is related to the ability of the virus to interrupt red cell development in the bone marrow. It is suspected that this sometimes happens in fifth disease, perhaps with significant changes in the blood. The second complication of fifth disease may arise when a pregnant woman is infected, with the possibility of harm to the unborn child.

While these studies continue, biochemists are analysing the human parvovirus particle with a view to classifying the virus more precisely. Their work will also help in new diagnostic tests and in studying the mode of spread of infection. The story of the human parvovirus is a good example of the way in which different disciplines can converge on a problem of shared interest. Clinicians, epidemiologists, virologists, haematologists and biochemists are all involved in intensive study of a subject that has grown in a few years from

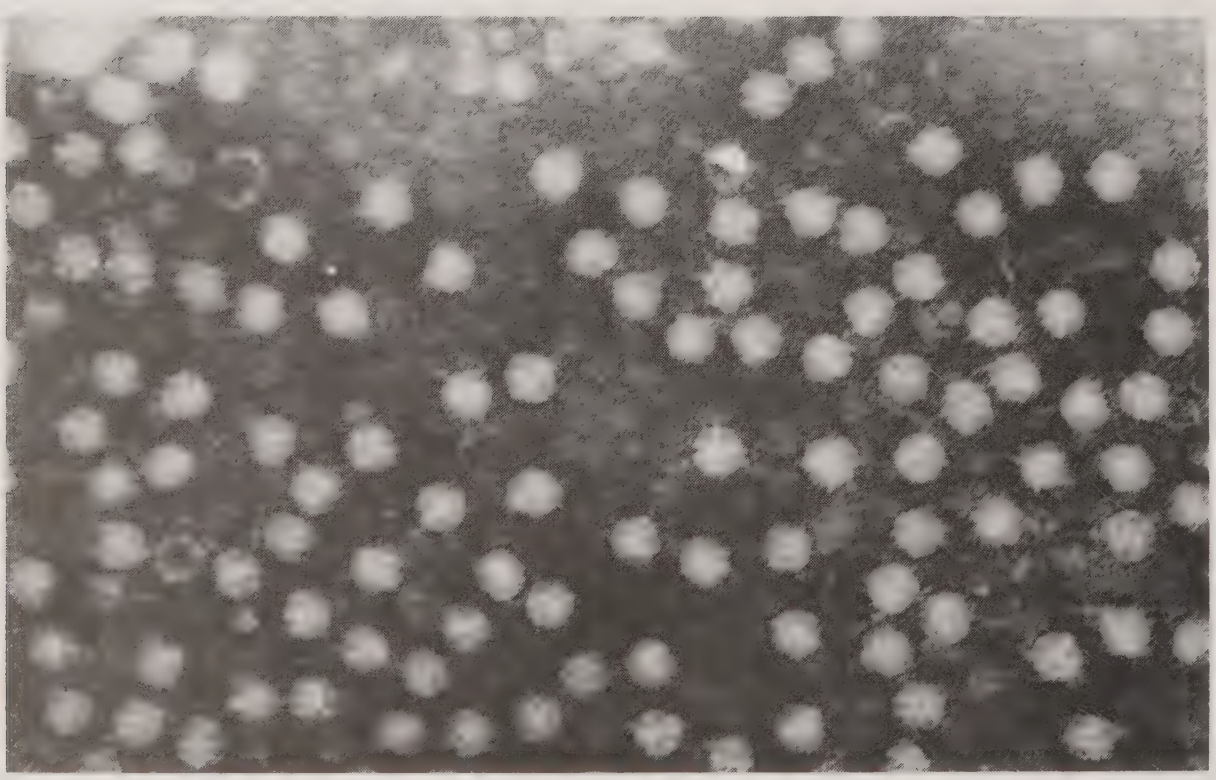

Figure 14 Human parvovirus particles (×189 000). In an acute human parvovirus infection the virus is abundant in the blood stream. After a few days antibody to the virus is made and the virus particles disappear from the blood. The antibody is of two main classes, M and G, the M class appearing slightly earlier than the G. Molecules of M antibody have five arms that can bind to the virus particle.

This electron micrograph shows clumps of virus concentrated from the serum of a patient with acute red cell aplasia. The serum contained both human parvovirus and antibody to it, of the M class only. Many spherical particles of the virus can be seen, some with the empty and incomplete shells typical of parvoviruses. The coarse strands which join the particles are thought to be the arms of M antibody molecules.

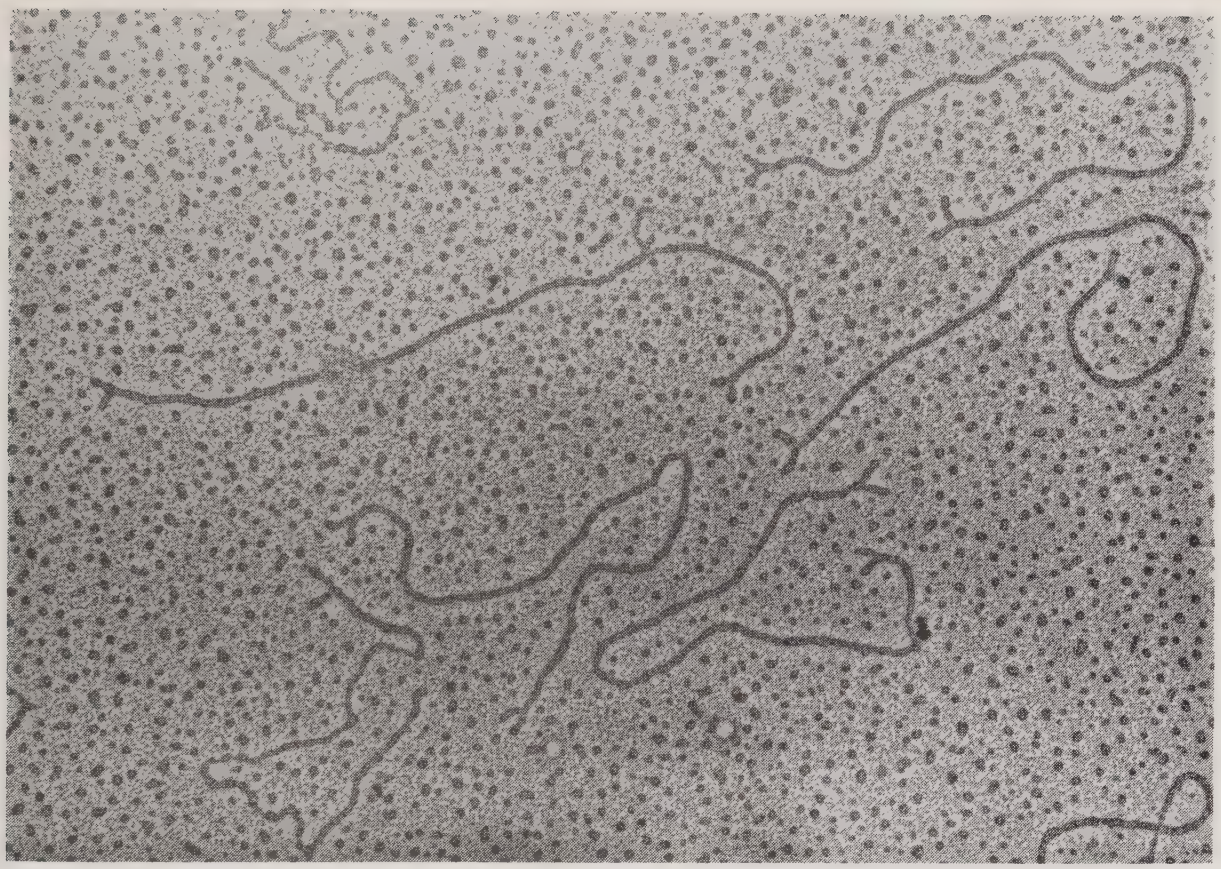

Figure 15 DNA extracted from human parvovirus particles (×31 000). Human parvovirus genetic material is made up of linear single-stranded DNA which may be in two complementary forms, the two forms being present in approximately equal numbers of virus particles. When DNA is extracted from the particles the complementary strands unite to make double-stranded molecules such as that illustrated in this electron micrograph. The forked structures seen are thought to be "hairpins" formed by the pairing of further complementary sequences at the end of each strand of the virus DNA. Terminal complementarity is a common feature of parvovirus DNA. [Electron micrograph prepared with the assistance of Pamela Beattie, Department of Molecular Biology, University of Edinburgh.]

some chance events. It also exemplifies the unpredictable, "accidental" nature of virological discovery, and teaches us always to leave a little room when planning research so that incidental observations can be investigated.

AUTOMATION IN MICROBIOLOGY

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The fundamental discoveries of the causes of sepsis and infectious disease which occurred in the latter half of the 19th century resulted in rapid development of a bacteriological technology much of which is still in use today. It has been argued that the current interest in changing that technology has much to do with recent major changes in medical practice which have resulted in the appearance of new forms of sepsis – particularly in

immunocompromised patients. More probably, however, the main motivating factors have to do with the fact that much diagnostic microbiology is labour intensive, overly subjective and, compared with other disciplines of pathology, slow in producing results. The large increase in specimens identified in the PHLS Annual Report for 1981/2 has not brought about any economy in the process of scaling-up the laboratory service. More specimens use more culture media, more bench space and more pairs of hands. It is believed by some that automation will provide an effective answer to these problems and, it is hoped, provide a better service for the patient.

Manufacturers of automated equipment appear to have concentrated in two areas. On the one hand systems have been produced which are designed to provide a more conveniently performed test with other improvements such as improved objectivity or greater speed. In this category some might include the mechanical systems for performance of ELISA tests or for assays of antimicrobials. Systems such as Autobac and MS2 for rapid antimicrobial susceptibiity tests could also be included. All of these are relatively expensive but have been shown to provide improvements in test quality and in convenience. However, such equipment does not alter the nature of the workload and at best provides an alternative method of carrying it out. Of greater potential interest to the hard pressed clinical laboratory is the recent appearance of a group of instruments designed for automated screening of specimens such as blood or urine. Here the concept is that specimens are pre-processed to select those likely to yield significant bacterial growth. As more than 75 per cent of specimens submitted for microbiological investigation produce no significant growth, the rapid identification of negatives has considerable attraction, particularly if the method is automated. This must account in part for the considerable sales of the semi-automated Bactec system for detection of bacteria in blood by radiometry. Presumably the reduced labour factor outweighs the disadvantage of introducing a radioactive isotope (^{14}C) into the clinical laboratory.

In a similar context there is considerable interest in the appearance of two instruments designed for the automated screening of urine. One of these is the Berthold instrument which comprises a fully automated system for detecting ATP based on bioluminesence. More recently a system which uses the Coulter principle for counting bacteria and cellular material electronically has been announced by Orbec Ltd. Both methods are rapid and capable of high throughput. Without wishing to anticipate the outcome of current evaluation studies, it can be stated that if either instrument fulfils its potential, workload on the urine bench should be dramatically reduced.

Obviously, credible automation is already with us and may even prosper in our current economically cold climate. The future for up-market systems offering great improvement in accuracy and reproducibility is uncertain but it does seem that instruments which provide a real cost saving will be successful, particularly if they reduce the tedium of screening and permit

greater bacteriological attention to the potentially positive specimens. Doubtless DNA probes will have their day; experience thus far shows that they will have to be presented as practical user-oriented systems.

LEPTOSPIROSIS IN CATTLE: A NEWLY EMERGENT OCCUPATIONAL HEALTH HAZARD

Dr Sheena Waitkins
PHLS Leptospira Reference Unit, Public Health Laboratory, County Hospital, Hereford HR1 2ER

Leptospirosis is probably the most widespread zoonosis in the world and has been known for many years in Great Britain. The organism which causes this disease is a spirochaete called *Leptospira* and there are 20 different pathogenic varieties recorded in the world literature. Only three of these are commonly found in the British Isles, although travellers and soldiers serving abroad may become infected with the more exotic varieties ("others" in Table 8). The two types found in this country hitherto, *L. icterohaemorrhagiae* and *L. canicola*, have been joined by another, *L. hardjo*, in the last four years.

Table 8 Human leptospirosis in the British Isles, 1978–83

Species	1978	1979	1980	1981	1982	1983
L. icterohaemorrhagiae	26 (40%)	23 (41%)	27 (56%)	39 (54%)	23 (37%)	39 (32%)
L. hebdomadis (hardjo)	33 (51%)	18 (33%)	13 (27%)	18 (25%)	13 (21%)	55 (46%)
L. canicola	5 (8%)	5 (9%)	2 (4%)	4 (6%)	7 (11%)	8 (7%)
Others	1 (1%)	9 (17%)	6 (13%)	11 (15%)	19 (31%)	18 (15%)
Total	65	55	48	72	62	120

In 1983, 46 per cent of all positive specimens submitted by laboratories in England and Wales to the PHLS Leptospira Reference Unit for confirmation were found to be due to *L. hardjo*; this compares with 27 per cent in 1981 and 0 per cent in 1967 (Figure 16). *L. hardjo* causes a milder illness than either *L. icterohaemorrhagiae* or *L. canicola*, usually flu-like, with fever, severe headache and often accompanied by mental confusion. In untreated cases full recovery may take several months and sometimes years; lethargy is the commonest symptom during the convalescent period. In a few

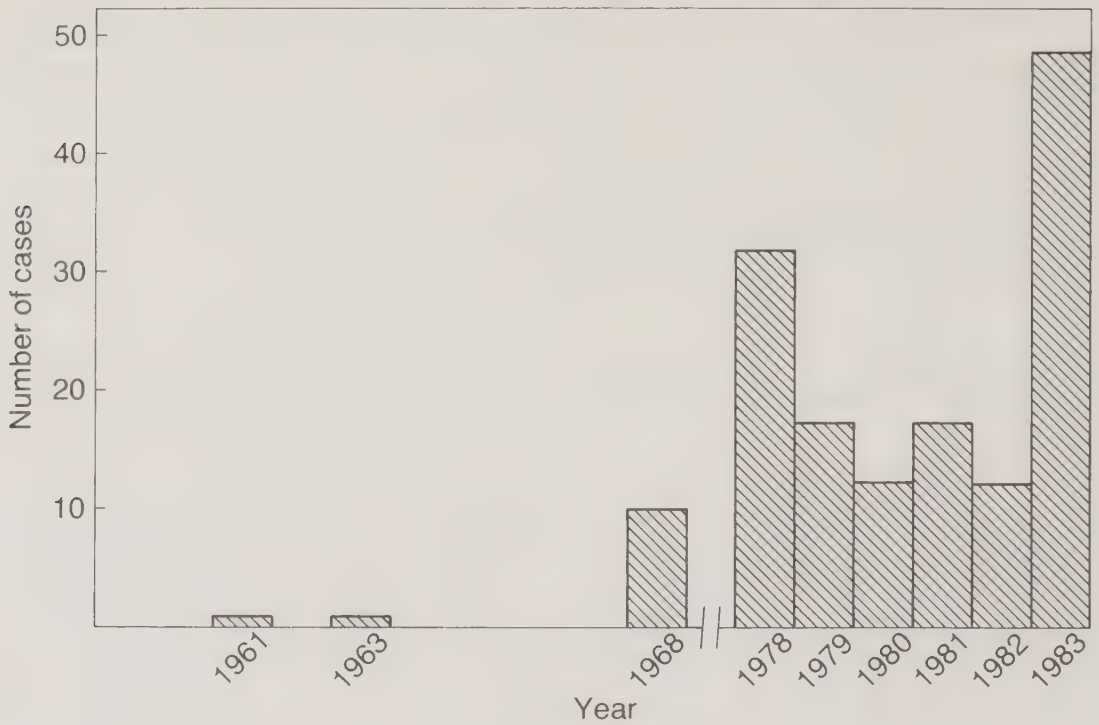

Figure 16 The emergence of *Leptospira hardjo* since 1959.

cases the symptoms may be followed by meningitis, occasionally kidney and liver failure and, rarely, death. Antibiotic treatment is, however, straightforward and usually results in complete recovery.

In cows *L. hardjo* is a common bacterial infection. One-third of all cattle herds in the United Kingdom are estimated to be infected with this organism. The leptospires are carried in the kidneys and excreted via the urine to infect other cows and humans. The symptoms in cattle are usually mastitis, commonly known as either "milk drop syndrome" or "flabby bag". Occasionally premature calving occurs, with resulting weakling calves, and about 10 per cent of all abortions are thought to be due to leptospirosis. These livestock casualties represent a considerable financial loss to the farming industry. The cost of human illness cannot, of course, be calculated.

Progress in the control of human and cattle infection has been limited by the absence of a quick, reliable method of diagnosis and the lack of knowledge of the pathogenesis of leptospirosis. The development of rapid methods, such as enzyme-linked immunosorbent assay (ELISA), has already facilitated the diagnosis in humans. The PHLS Leptospira Reference Unit has developed this technique further and now provides ELISA kits for this purpose to clinical laboratories. The search continues for more accurate and specific tests, both for the diagnosis of the disease and the identification of leptospires.

Although a vaccine has been introduced for veterinary use which may be expected to control infection in cattle, and hence human infections, progress is likely to be slow unless an eradication scheme is introduced, which is unlikely in the present-day financial climate. In any event, recent work carried out at the PHLS Leptospira Reference Unit suggests that the cow is

not the only animal reservoir of *L. hardjo*. It has been shown that the coypu may also carry *L. hardjo*, making the eventual control of cattle-associated leptospirosis by vaccination less readily achievable.

Because of the pessimistic view of *L. hardjo* control, there is an urgent need to understand the pathogensis of this disease in man. With the co-operation of the PHLS Communicable Disease Surveillance Centre, a detailed study of occupations at risk from cattle-associated leptospirosis showed that over 80 per cent of workers who suffered from this disease were cowmen who regularly milked their cows. Further, all these cowmen used the herringbone type of milking parlour in which men work at eye level with the cow's udder (see Figure 17). Droplets of contaminated urine could, therefore, be easily inhaled, or come in contact with the cowmen's eyes. A detailed study carried out on 270 blood samples from dairymen in

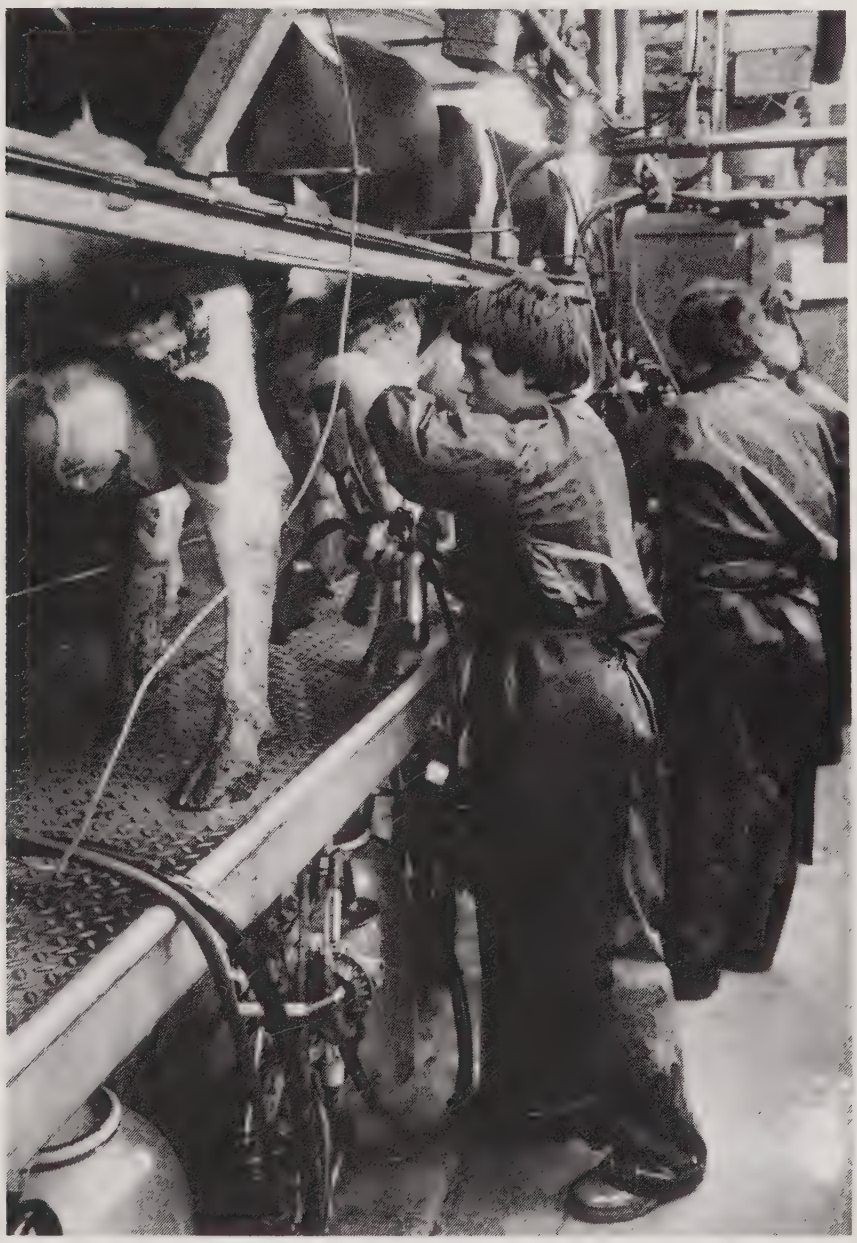

Figure 17 A typical milking parlour, showing the relative positions of cow and cowman. Splashes of cows' urine can easily be transferred to a cowman. [Reproduced by kind permission of Hereford Times PLC.]

Herefordshire showed the overall incidence of the infection to be about 4 per cent. If the same apples to dairymen throughout the UK, the number of undiagnosed cases of *L. hardjo* leptospirosis must be considerable. Alternative protective measures need to be examined, and this problem is already being tackled with the help of the PHLS, so that, within the next few years, cattle-associated leptospirosis may be fully diagnosed, readily treated and, it is hoped, eradicated.

PUBLIC HEALTH AND PUBLIC KNOWLEDGE

Mr E. M. D. Scott
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The public images of "science" and "medicine" have changed considerably in the past hundred years. The late 19th century was a period of enormous progress in science and medicine, and public attitudes to practitioners of these crafts were formed by political viewpoints and media presentation which implied that scientific advances would bring vast improvements to the lot of Man in the so-called "developed" world. Whether such implication was valid is a matter for personal opinion. What is unarguable is that improvements in public health medicine, founded on many of the great 19th century discoveries, led to methods for the diagnosis and treatment of a wide range of communicable diseases in the world as a whole and brought within sight the eradication of several of them.

It can be argued, however, that this very success bred the seeds of other problems, leading to the present public and media attitudes to infectious disease. During the year covered by this Annual Report there was more than one occasion on which the difficulties of fostering objective public reaction to matters concerning the work of the Service were made manifest. The most striking of these was the result of media reaction to an administrative proposal to move laboratory testing of samples from patients suspected of suffering infection by "special pathogens", such as the Lassa virus, from the PHLS Centre for Applied Microbiology and Research to the new Central Public Health Laboratory (when it opens). In view of the way in which the proposal was treated in the media (see Figure 18), it was hardly suprising that a significant number of residents of Colindale were greatly alarmed. The underlying reasons for this alarm are not so easily isolated; however, the different use of language by the specialist and the non-specialist is undoubtedly a factor.

At an almost trivial level, the microbiologist uses the word "epidemic" in a technical sense to refer to almost any outbreak of a communicable disease – even when the number of patients involved may be only two or three within a tight social group such as a family. The microbiologist forgets that to A. P. Herbert's man on the Clapham omnibus the word "epidemic" is heavily emotionally loaded, and can imply rampant and uncontrollable spread of

THE STANDARD

Thursday, January 12, 1984 17p Incorporating the Evening News

CLOSING PRICES

French grab another lorry

THE LAMB war between Britain and France escalated today when a third lorry was hijacked by French farmers and part of its contents burned.

And although the French Government, in the face of a torrent of British protest, ordered the release of two drivers held hostage by French farmers since yesterday, there was no sign of any hurry about it.

The third UK victim of the French protest against meat imports was a lorry from Northern Ireland, with a load of lamb and beef.

Driver David Maxwell was hauled from his cam. The lamb was set on fire, and the beef sprayed with diesel.

And, said an angry spokesman from Mr Maxwell's firm, the French police stood by and let it happen.

"David told us the police just stood aside and did absolutely nothing to help him," said a spokesman for Persitt International, the Antrim firm which owns the lorry.

The incident added fresh fuel to the full-scale political storm that has now blown up over the lorry hijacks.

Labour leader Mr Neil Kinnock, who is in Paris, waded into the French Government, declaring that British lorry men were being "terrorised" and demanded that they be protected.

At the same time, Agriculture Minister Mr Michael Jopling telephoned his French opposite number to make a direct and personal protest, and to ask for the lorries and their drivers — Les Stocker, from Shrewsbury, and John Barlow, from York—to be freed.

Although Mr Jopling said

Continued Page 2, Col 3

by Charles Reiss

LONDON GERM LAB PLAN

A LABORATORY specialising in deadly diseases may soon move from the research establishment at Porton Down to north London.

A proposal to move the Special Pathogens Unit to a new building in the grounds of Colindale Hospital is to be considered later this month.

It would handle analysis and diagnostic work presently being carried out at Porton Down, a centre which conducted extensive research into biological weapons when under the control of the Ministry of Defence.

The new laboratory block at Colindale, in the grounds of the hospital and close to houses and a Tube station, has been specially built to house a high-security unit.

Transfer

It includes an area for animals on which experiments involving dangerous virusses can be carried out. Rabies, lassa fever and Green Monkey disease are among those analysed and researched at the Special Pathogens unit.

One report today suggested that the whole facility, including research, was to move to London. The Department of Health denied this.

A spokesman said: "The prosposal being discussed concerns the possible transfer of only part of the work."

A diagnostic laboratory for dangerous disease has been in use at Colindale since 1946 but the proposal to extend this is sure to meet stiff local opposition.

Colindale councillor Geof Cooke said today: "This is a densely populated are a with homes close by the building. "Next door to it is a nurses' home. It is the wrong place for a laboratory handling dangerous organisms. That sort of thing should be out in the country where if there is a breach of security the threat is minimised."

Mr Cooke added: 'Residents already accept the present risk grudgingly. This idea strikes me as a crazy, monstrous notion."

Part of the old laboratory at Colindale was closed down by the Health and Safety Executive in 1979. It was ruled unsafe following a tightening of precautions after the deaths of two research workers in Birmingham.

Exercise

This led to proposals for the new building, now nearing completion.

Experiments carried out in the Special Pathogens laboratory are conducted amid rigorous security in restricted areas where even the air is conditioned through special filters.

The proposal to move part of the work to London is one of several being considered in a cost pruning exercise required by the Department of Health.

The department stressed today that no decision had been made yet, and the matter is to be considered by the Public Health Laboratory Service board which meets later this month.

The board's chairman, Professor Gordon Smith, a former director of the Microbial Research Laboratory at Porton Down said: "This proposal is one of a number of ideas that are being considered.

Diagnostic

"But I must stress that whatever happens the laboratory will be safe. Whether it is in the middle of Wiltshire or in the middle of London it must and will be safe.

"There is already a high-security diagnostic unit at Colindale and there has been

Continued Page 2, Col 1

by Keith Dovkants

Standard Picture: MIKE MOORE

"WONDERFUL"—Pamela Stephenson today.

Star Pamela's little Yin . . .

THE Big Yin's Little Yin, Daisy, went home with her happy parents today.

Mother Pamela Stephenson, wearing a Japanese-style jacket and cuddling her 8lb. daughter, said outside the Portland Hospital for Women and Children that she felt "wonderful."

And father Billy Connolly, wearing a dark jacket and tartan scarf, said: "She's a lively wee thing, and Pam is brilliant."

Daisy, born on New Year's Eve, wore a red woollen hat and was wrapped in a shawl.

Asked about plans for her future, Billy said: "We haven't thought about it really. I don't care what she grows up to do. These days it's open day for women, so I expect she'll be okay.

"It would be nice to take little Daisy on tour. Babies are so portable," he added.

Standard Reporter

... Entertainment Guide 25 • Letters 17 • Ad Lib 23 • Delia Smith 28 • Patric Walker 29 • City 42

Figure 18 The front page of *The Standard*, 12 January 1984.

anything from 'flu to syphilis (a communicable disease with its own in-built emotional loading). It has now been many years since there has been what *popular usage* of the term would justifiably merit the name "epidemic" in the UK; the influenza outbreaks of the late 1950s are perhaps the most recent example – nearly 30 years ago. While this is a pertinent comment on the successes of public health microbiology this century, it is easy to see how media reference to, for example, "an epidemic of Legionnaires' disease"

can give a public impression markedly different from the information which the microbiologist quoted may have been intending to convey.

Naturally it is the hope of all of us that we can maintain current levels of public health and that, as in the case of smallpox, some communicable diseases can be eradicated completely. In the meantime, however, it is worth bearing in mind the fact that, for all but the last hundred years or so of Man's existence, men and women lived in nearly complete impotence and ignorance about the onset of communicable diseases. It is hardly suprising, therefore, that the thought of such diseases – and even their laboratory diagnosis – should conjure spectres in the minds of many people. Moreover, such spectres can rapidly achieve bodily substance by donning a cloak of information which is all too easily interpreted to have an appearance utterly at variance with that intended by its originator.

It is perhaps apposite to point out that governments, charities and commercial organizations spend much money each year on trying to modify public attitudes in the field of health care. These campaigns may range from education about the dangers of smoking to emphasis on the preventive medical value of good personal hygiene. No one has ever managed to measure the degree of effectiveness of such campaigns in a way which avoids criticism. There is one form of public education, however, that is known to work highly effectively. As a result of public reaction in Colindale to the incidents mentioned above, a public offer was made to residents to visit the laboratories and learn more about what happens there at first hand. At the time of writing, some 250 people have availed themselves of this invitation and have been shown around the Central Public Health Laboratory and, as a consequence, have left with a much improved understanding of what the laboratory and its staff are there to do.

In conclusion, the strands of this brief comment should be tied into a loose knot. Public knowledge is influenced by many different sources of information – from solid education and well founded "informatory" campaigns to old wives' tales and sensationalist journalism. The most valuable way of influencing public knowledge is by direct action: "seeing is believing". Finally, it behoves all those involved in the fields of public health and communicable disease to be as forthcoming as possible in commenting in public – and indeed even in our private lives – on the subject; science and medicine no longer have the cachet of uncritical public approval which they formally had, and so more care than ever is needed in "getting the message across".

Senior Staff Changes

NEW APPOINTMENTS

Dr M. Ashraf	Consultant Medical Microbiologist, Guildford, 1.8.83.
Dr E. T. C. Bowen	Top Grade Microbiologist, Acting Director, Special Pathogens Reference Laboratory, CAMR, 1.10.83.
Dr P. M. Cockroft	Consultant Medical Microbiologist, Portsmouth, 24.10.83.
Dr A. Doyle	Principal Grade Microbiologist, Vaccine Research and Production Laboratory, Curator, National Collection of Animal Cell Cultures, CAMR, 1.12.83.
Dr P. H. Jones	Consultant Medical Microbiologist, Director, Ipswich, 1.6.83.
Mr G. J. Harper	Top Grade Microbiologist, Acting Director, Environmental Microbiology and Safety Reference Laboratory, CAMR, 1.1.84.
Dr Anne G. McCormick	Consultant Epidemiologist, Communicable Disease Surveillance Centre, 1.11.83.
Dr O. A. Okubadejo	Consultant Medical Microbiologist, Director, Portsmouth, 1.2.83.
Dr R. N. Peel	Consultant Medical Microbiologist, Director, Leeds, 13.2.84.
Dr S. F. Pugh	Consultant Virologist, Nottingham, 5.4.84.
Dr Anita M. Rampling	Consultant Medical Microbiologist, Cambridge, 1.3.84.
Mr M. R. Turner	Commissioning Officer/Administrator, Central Public Health Laboratory, 20.6.83.
Dr Anne H. C. Uttley	Consultant Medical Microbiologist, Director, Dulwich, 1.10.83.

TRANSFERS

Dr C. Dulake	Consultant Medical Microbiologist, Director, Ashford, from Maidstone, 1.1.84
Dr J. B. Selkon	Consultant Medical Microbiologist, Director, Oxford, from Newcastle, 1.5.83
Dr A. E. Wright	Consultant Medical Microbiologist, Director, Newcastle, from Environmental Microbiology and Safety Reference Laboratory, CAMR, 1.1.84.

RETIREMENTS

Dr B. E. Andrews	Consultant Medical Microbiologist, Norwich, 31.3.84
Dr G. I. Barrow	Consultant Medical Microbiologist, Chelmsford 31.3.84
Dr Suzanne Clark	Consultant Virologist, Bristol, 19.3.84
Dr G. L. Gibson	Consultant Medical Microbiologist, Director, Leeds, 30.9.83
Dr J. V. T. Gostling	Consultant Medical Microbiologist, Director, Ipswich, 31.5.83.
Dr P. G. Mann	Consultant Medical Microbiologist, Director, Bath, 4.3.84
Dr E. R. Mitchell	Consultant Medical Microbiologist, Maidstone, 30.9.83
Dr R. Pilsworth	Consultant Medical Microbiologist, Director, Chelmsford, 31.12.83.
Dr T. M. Pollock	Consultant Medical Microbiologist, Director, Epidemiological Research Laboratory, CPHL, 15.6.83.
Dr J. Nagington	Consultant Virologist, Cambridge, 10.9.83
Dr Mair E. M. Thomas	Consultant Medical Microbiologist, Epidemiological Research Laboratory, CPHL, 21.1.84

RESIGNATIONS

Dr R. T. Mayon-White	Consultant Epidemiologist, Oxford, 30.11.83.
Professor D. I. H. Simpson	Consultant Virologist, Director, Special Pathogens Reference Laboratory, CAMR, 30.9.83.

Honours, Awards and External Offices

Mr A. J. Broadbent	Winner (1983), J. D. Atkinson Memorial Prize
Dr J. B. Griffiths	UK Regional Editor, *Vaccine*
Dr R. J. Gilbert	Scientific Advisor, Camden Food Preservation Research Association, Ministry of Agriculture, Fisheries and Food
Dr M. J. Hill	Joseph Lister Memorial Lecturer, Canadian Medical Association, 1983
Dr B. Jackson	Honorary Clinical Tutor (Microbiology), Welsh National School of Medicine
Dr N. J. Mitchell	Vice-Chairman, Shropshire Health Authority
Professor F. W. O'Grady	Commander of the Order of the British Empire
Dr R. N. Peel	Editor, *Broadsheet* (Microbiology), Association of Clinical Pathologists
Mrs D. A. Shaw	R. J. Lavington, Malcolm Breach and Midland Region Prizes of the Institute of Medical Laboratory Sciences
Dr C. E. D. Taylor	Editor, *Journal of Infection*, and President, British Society for the Study of Infection
Dr J. E. M. Whitehead	Vice-President, Royal College of Pathologists
Dr A. E. Wright	Honorary Lecturer in Microbiology, University of Newcastle upon Tyne

Senior PHLS Staff

The following lists are accurate as at 31 October 1984.

HEADQUARTERS OFFICE

61 Colindale Avenue, London NW9 5EQ
Tel: 01-200 1295

Dr J. E. M. Whitehead	Director of the Service
Dr Joan R. Davies	Deputy Director of the Service (part-time)
Dr P. D. Meers	Deputy Director of the Service
Mr R. B. Paget	Secretary to the Board
Mr J. M. Harker	Deputy Secretary to the Board
Mr K. M. Saunders	Treasurer to the Board
Mrs Susan D. Chaney	Deputy Treasurer to the Board
Mr D. S. Broadfield	Personnel Officer
Mr M. Whitney	New Colindale Project Manager
Mrs Christine R. Shipp	Acting Manager, PHLS Computer Services
Mr M. R. Turner	New Colindale Commissioning Officer *and* Administrator Designate, Central Public Health Laboratory
Mr J. B. Towell	Supplies Officer

CENTRAL PUBLIC HEALTH LABORATORY

Colindale Avenue, London NW9 5HT
Tel: 01-205 7041

Professor A. A. Glynn	Director
Mr V. Fuller	Acting Administrator
Mrs Susan M. Bloomfield	Chief Librarian
Dr B. Rowe	Director, Division of Enteric Pathogens
Dr E. Mary Cooke	Director, Division of Hospital Infection

Dr A. G. Taylor	Acting Director, Division of Microbiological Reagents and Quality Control
Dr Sheila Polakoff	Acting Director, Epidemiological Research Laboratory
Dr R. J. Gilbert	Director, Food Hygiene Laboratory *and* Deputy Director, Central Public Health Laboratory
Dr L. R. Hill	Curator, National Collection of Type Cultures
Dr Marguerite S. Pereira	Director, Virus Reference Laboratory

PHLS CENTRE FOR APPLIED MICROBIOLOGY AND RESEARCH

Porton Down, Salisbury, Wiltshire SP4 0JG
Tel: 0980-610391

Dr P. M. Sutton	Director
Mr P. Holmes	Deputy Director
Mr I. R. Ingrey-Counter	Administrator
Mr D. Kitching	Deputy Administrator
Dr M. J. Hill	Director, Bacterial Metabolism Research Laboratory
Dr A. Baskerville	Director, Experimental Pathology Laboratory
Professor A. Atkinson	Director, Microbial Technology Laboratory
Mr G. J. Harper	Acting Director, Environmental Microbiology and Safety Reference Laboratory
Dr P. J. Greenaway	Director, Molecular Genetics Laboratory
Professor D. C. Ellwood	Director, Pathogenic Microbes Research Laboratory
Dr E. T. W. Bowen	Acting Director, Special Pathogens Reference Laboratory
Dr H. E. Wade	Director, Therapeutic Products Laboratory
Professor J. Melling	Director, Vaccine Research and Production Laboratory

PHLS COMMUNICABLE DISEASE SURVEILLANCE CENTRE

61 Colindale Avenue, London NW9 5EQ
Tel: 01-200 6868

Dr N. S. Galbraith	Director
Dr Susan E. J. Young	Deputy Director
Mr A. A. Collins	Administrator

OTHER REFERENCE LABORATORIES AND UNITS

Dr A. T. Willis	Director, PHLS Anaerobe Reference Unit, PHLS Laboratory, Luton
Dr Joan R. Davies	Director, PHLS Influenza Research Unit, PHLS Laboratory, Guildford
Dr Sheena M. Waitkins	Director, PHLS Leptospira Reference Unit, PHLS Laboratory, Hereford
Professor D. J. Bradley	Co-Director, PHLS Malaria Reference Laboratory, London School of Hygiene and Tropical Medicine
Professor W. Peters	Co-Director, PHLS Malaria Reference Laboratory, London School of Hygiene and Tropical Medicine
Dr P. A. Jenkins	Director, PHLS Mycobacterium Reference Unit, PHLS Laboratory, Cardiff
Professor D. W. R. Mackenzie	Director, PHLS Mycological Reference Laboratory, London School of Hygiene and Tropical Medicine
Dr R. H. Leach	Acting Director, PHLS Mycoplasma Reference Laboratory, PHLS Laboratory, Norwich

REGIONAL LABORATORIES

Addresses and telephone numbers of PHLS regional laboratories are listed in relevant telephone directories.

Dr J. G. P. Hutchison	Director, PHLS Laboratory, Birmingham
Dr A. E. Jephcott	Director, PHLS Laboratory, Bristol
Dr C. E. D. Taylor	Director, PHLS Laboratory, Cambridge
Dr C. H. L. Howells	Director, PHLS Laboratory, Cardiff
Dr R. N. Peel	Director, PHLS Laboratory, Leeds

Dr G. C. Turner	Director, PHLS Laboratory, Liverpool
Dr D. M. Jones	Director, PHLS Laboratory, Manchester
Dr A. E. Wright	Director, PHLS Laboratory, Newcastle upon Tyne
Dr J. B. Selkon	Director, PHLS Laboratory, Oxford
Dr O. A. Okubadejo	Director, PHLS Laboratory, Portsmouth
Dr B. W. Barton	Director, PHLS Laboratory, Sheffield

AREA LABORATORIES

Addresses and telephone numbers of PHLS area laboratories are listed in relevant telephone directories.

Dr C. Dulake	Director, PHLS Laboratory, Ashford
Dr Diana G. White	Director, PHLS Laboratory, Bath
Dr B. T. Thom	Director, PHLS Laboratory, Brighton
Dr Margaret A. Knowles	Director, PHLS Laboratory, Carlisle
Dr H. D. S. Morgan	Director, PHLS Laboratory, Carmarthen
Dr Pauline M. Poole	Director, PHLS Laboratory, Chester
Dr P. R. Mortimer	Director, PHLS Laboratory, Coventry
Dr Patricia Gill	Director, PHLS Laboratory, Dorchester
Dr D. R. Gamble	Director, PHLS Laboratory, Epsom
Dr R. J. C. Hart	Director, PHLS Laboratory, Exeter
Dr K. A. V. Cartwright	Director, PHLS Laboratory, Gloucester
Professor R. Y. Cartwright	Director, PHLS Laboratory, Guildford
Dr I. R. Ferguson	Director, PHLS Laboratory, Hereford
Dr S. L. Mawer	Director, PHLS Laboratory, Hull
Dr P. H. Jones	Director, PHLS Laboratory, Ipswich
Dr C. J. Mitchell	Director, PHLS Laboratory, Leicester
Dr J. G. Wallace	Director, PHLS Laboratory, Lincoln
Dr D. A. McSwiggan	Director, PHLS Laboratory, Central Middlesex Hospital, London
Dr Anne H. C. Uttley	Director, PHLS Laboratory, Dulwich, London
Dr D. G. Fleck	Director, PHLS Laboratory, Tooting, London
Dr B. Chattopadhyay	Director, PHLS Laboratory, Whipps Cross, London
Dr A. T. Willis	Director, PHLS Laboratory, Luton
Dr E. McKay-Ferguson	Director, PHLSLaboratory, Middlesbrough

Dr W. Shepherd	Director, PHLS Laboratory, Norwich
Dr M. J. Lewis	Director, PHLS Laboratory, Nottingham
Dr R. S. Jobanputra	Director, PHLS Laboratory, Peterborough
Dr P. J. Wilkinson	Director, PHLS Laboratory, Plymouth
Dr W. L. Hooper	Director, PHLS Laboratory, Poole
Dr D. N. Hutchinson	Director, PHLS Laboratory, Preston
Dr J. V. Dadswell	Director, PHLS Laboratory, Reading
Dr F. B. Jackson	Director, PHLS Laboratory, Rhyl
Dr Sharon Patrick	Director, PHLS Laboratory, Salisbury
Dr C. A. Morris	Director, PHLS Laboratory, Shrewsbury
Dr A. D. Pearson	Director, PHLS Laboratory, Southampton
Dr J. Gray	Director, PHLS Laboratory, Stoke-on-Trent
Dr W. Kwantes	Director, PHLS Laboratory, Swansea
Dr J. V. S. Pether	Director, PHLS Laboratory, Taunton
W. A. Telfer Brunton	Director, PHLS Laboratory, Truro
Dr M. T. Moulsdale	Director, PHLS Laboratory, Watford
Dr R. G. Thompson	Director, PHLS Laboratory, Wolverhampton

Principal Committees

Chairmen and secretaries of committees are given as at 31 October 1984.

COMMITTEES APPOINTED BY THE BOARD

Capital Projects Committee	*Chairman*: Mr C. C. Stevens *Secretary*: Mr J. M. Harker
Steering Committee on Income Generating Activities	*Chairman:* Professor M. H. Richmond *Secretary:* Mr J. M. Harker
Finance Committee	*Chairman:* Dr C. E. Gordon Smith *Secretary:* Mr K. M. Saunders
Ethical Committee	*Chairman:* Professor Rosalinde Hurley *Secretary:* Professor A. A. Glynn

OTHER PHLS COMMITTEES, SUBCOMMITTEES AND WORKING PARTIES

Steering Committee on National External Quality Assessment in Microbiology	*Chairman:* Dr Joan R. Davies *Secretary:* Dr I. D. Farrell
Standing Advisory Committee on Electron Microscopy	*Chairman:* Dr T. H. Flewett *Secretary:* Dr Anne M. Field
Standing Advisory Committee on Influenza	*Chairman:* Dr R. J. C. Hart *Secretary:* Dr C. A. Morris
Standing Advisory Committee on Laboratory Safety	*Chairman:* Dr A. E. Wright *Secretary:* Dr J. V. S. Pether
Publications Editorial Committee	*Chairman:* Dr R. J. C. Hart *Secretary:* Mr E. M. D.Scott
Publications Management Committee	*Chairman:* Mr J. M. Harker *Secretary:* Mr J. B. Towell
Standing Advisory Committee on Seriological Reagents	*Chairman*: Dr Joan R. Davies *Secretary:* Dr A. G. Taylor
Standing Advisory Committee on Sexually Transmitted Diseases	*Chairman:* Dr G. C. Turner
Standing Advisory Committee on Monoclonal Antibodies	*Chairman:* Professor A. A. Glynn

Subcommittee on Hepatitis	*Chairman:* Dr J. Craske *Secretary:* Dr Sheila Polakoff
Library Policy Subcommittee	*Chairman:* Dr P. D. Meers *Secretary:* Mrs Susan Bloomfield
Subcommittee on Salmonellas	*Chairman:* Dr J. G. Cruickshank *Secretary:* Dr S. L. Mawer
Standing Committee on the Microbiology of Water	*Chairman:* Dr J. V. Dadswell *Secretary:* Dr M. J. Lewis
Working Party on Human Infections by Group B Streptococci	*Convenor:* Dr B. T. Thom
Working Group on Campylobacter Infections	*Chairman:* Dr M. B. Skirrow
Working Party on Viral Gastroenteritis	*Chairman:* Dr D. A. McSwiggan *Secretary:* Dr M. Appleton
Working Party on the Epidemiological and Virological Aspects of Fifth Disease	*Chairman:* Dr P. P. Mortimer *Secretary:* Dr Susan M. Hall
Computer Services Steering Group	*Chairman:* Dr P. D. Meers *Secretary:* Mrs Christine Shipp
Zoonoses Consultative Panel	*PHLS representatives*: Director of the Service (or Deputy), Professor R. Y. Cartwright, Dr R. J. C. Hart, Dr B. Rowe

Accounts of the PHLS Board 1983/4

The table on the following page provides a summary of the accounts of the PHLS Board for 1983/4 which has yet to be subjected to formal government audit.

Table 9 Accounts of receipts and payments for the year ended 31 March 1984

Receipts				Payments				
Prior year end. 31 March 1983				Prior year end. 31 March 1983		Salaries, including superannuation contributions	Other expenditure	Total
£		£	£	£		£	£	£
250 936	Balance 1 April 1983		201 415		*Current*			
29 937 947	Department of Health and Social Security advances		32 792 247					
1 402 740	Welsh Office advances		1 444 000	1 084 859	Administration	647 364	718 273	1 365 637
				4 983 006	Central and special laboratories	3 382 074	1 579 628	4 961 702
	Public Health Laboratory Service laboratories				Centre for Applied			
	Grants from other organizations			5 642 226	Microbiology and Research	3 447 757	3 014 086	6 461 843
25 162	World Health Organization	35 651		16 418 325	Constituent laboratories	13 293 373	4 391 886	17 685 259
93 333	Medical Research Council	25 937						
59 725	Cancer Research Campaign	–			Central supply services			
77 371	Other bodies	129 560	191 148		Excess of purchase over issues	–	84 134CR	84 134CR
				80 251	Central services	162 460	232 201	394 661
	Proceeds of sales, fees, etc.			386 919				
41 326	Sales of cultures and reagents	43 699						
198 493	Central supply services to other bodies	175 373		28 595 586	Total current payments	20 933 028	9 851 940	30 784 968
2 510 769	Rechargeable salaries and services	2 899 905						
33 420	Bench fees	48 623						
34 216	Other receipts	76 452	3 244 052					
					Capital			
	Centre for Applied Microbiology and Research							
	Grants from other organizations			8 561 869	New buildings and associated equipment			10 416 179
—	World Health Organization	4 697						
83 217	Medical Research Council	111 900						
128 779	Cancer Research Campaign	212 342		201 415	Balance 31 March 1984			222 163
185 069	Other bodies	744 201	1 073 140					
	Proceeds of sales, fees, etc.							
1 098 457	Sales of products, etc.	933 964						
864 057	Other receipts	176 784	1 110 748					
	Capital payments recharged							
18 492	PHLS	126 996						
315 361	CAMR	1 239 564	1 366 560					
£37 358 870			£41 423 310	£37 358 870				£41 423 310

The cost of this service, administered by the Public Health Laboratory Service Board, was borne on Health and Personal Social Services, England, Class XI, Vote 1, and for the Welsh laboratories on Class XVI, Vote 1.

Special funds: The Board held balances of £1944 as at 31 March 1984.

Statement of losses, etc.: Cases of loss or compensation totalled £3746.06, comprised as follows: 24 compensation payments, £419.99; five losses due to theft (three of cash, £84.87, and two of equipment, £780.00), £864.87; two personal injury settlements, £966.79; one salary overpayment, £1432.85; accumulated stores stock write offs, £61.56.